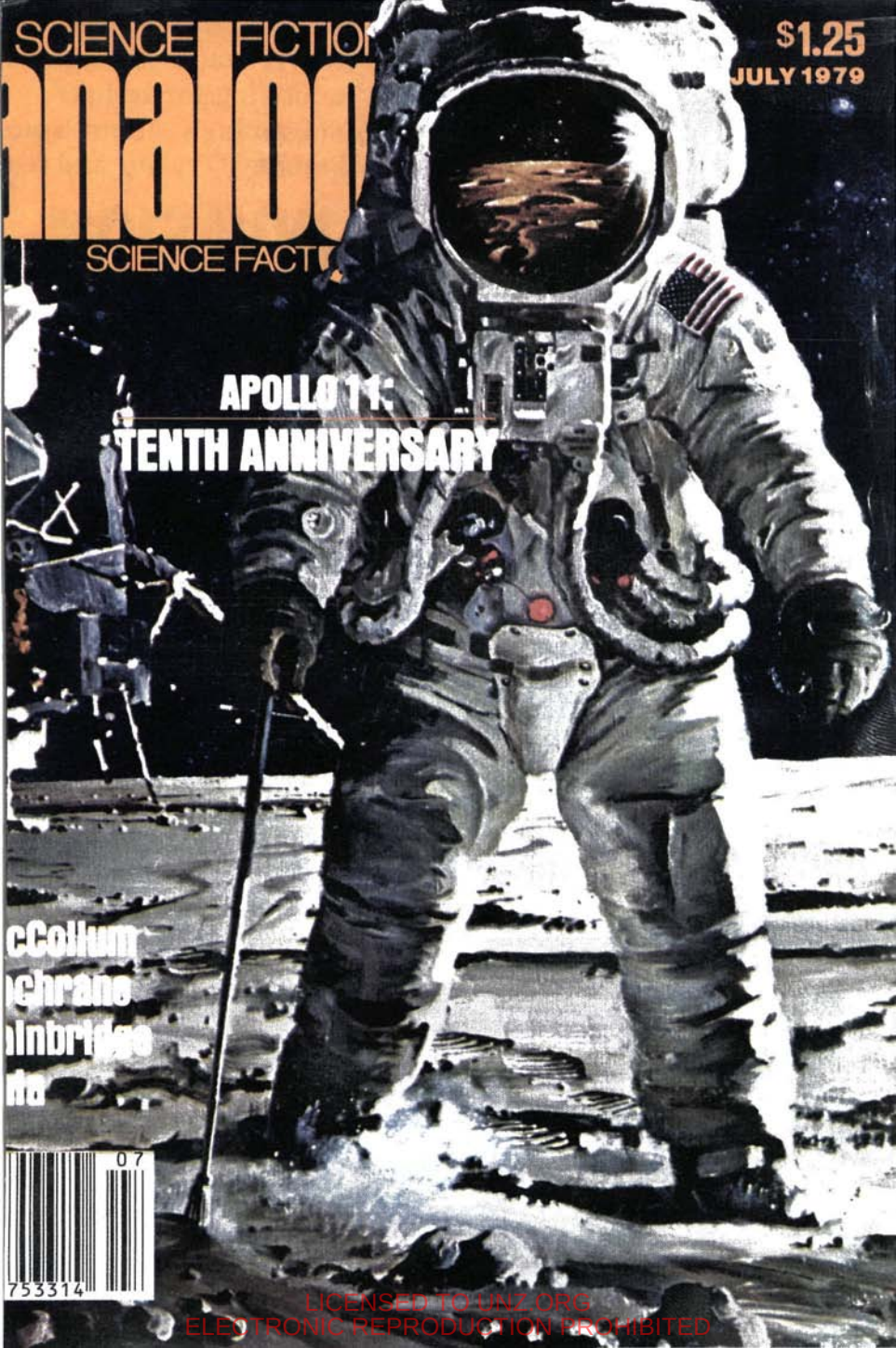

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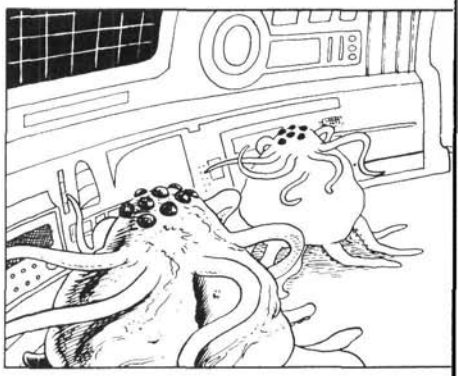
INVASION of the AIR-EATERS



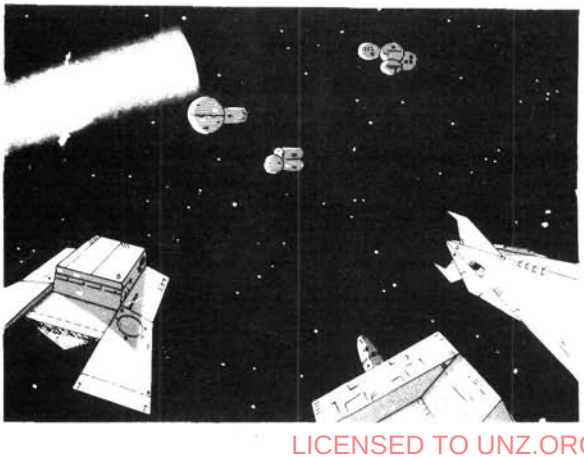
It's 1983, and our air is going bad. An alien generation-ship has invaded Earth with fantastic weapons . . . and air converters. These survivors from another star are remaking Terra to suit their own needs – despite "indigenous biological activity." Mankind's back is against the wall. We must win – or die gasping.

INVASION OF THE AIR EATERS is a grand strategic level simulation of your favorite pulp fantasy – the Aliens Who Want Earth. The game map represents the whole world; turns represent three months each. The Alien player commands strange and powerful units as he tries to change the Earth's air and kill off the pesky natives. The Terran controls Earth's aircraft, tank armies, and sub fleets. Solitaire play is possible against a programmed Alien attack – or Earth's nations can be represented by different players for group gaming.

Components include 24-page rulebook with color cover, 12" x 14" world map, and 135 play counters. INVASION OF THE AIR EATERS costs $2.95 – or $2.50 to *The Space Gamer* subscribers.

HOLY WAR

MicroGame 13 $2.95



Amtik the god had a problem. Most o men in the universe (that is, inside his 400 km-long body) no longer believed in him. the Holy Band remained faithful. And no Amtik was in danger from his own creatio The Sun-Throwers were hurling suns at hi sensor ducts. A hit would dissipate Amtik free his "inhabitants." Should he grant th Holy Band the divine intervention they w or let the battle take its course? After all, got really bored, he could just turn off his creations entirely . . .

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HOLY WAR includes a 24-page ruleb 135 unit counters, and a 12" x 14" map. price is $2.95 – $2.50 for TSG subscriber

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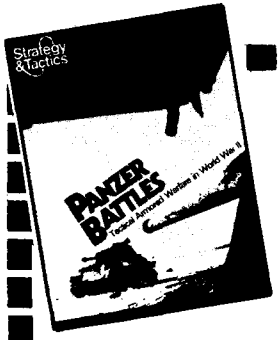

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Next Issue on Sale
July 3, 1979
$10.00 per year in the U.S.A.
$1.25 per copy

Cover by Robert McCall

Vol. XCIX No. 7
JULY 1979

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analog®
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ANALOG SCIENCE FICTION/SCIENCE FACT is published monthly by The Conde Nast Publications Inc., Conde Nast Building, 350 Madison Avenue, New York, New York 10017. S.I. Newhouse, Jr., Chairman, Robert J. Lapham, President, Fred C. Thormann, Secretary-Treasurer.

Second class postage paid at New York, N.Y. and at additional mailing offices. Subscriptions: in U.S. and possessions $10.00 for one year, $18.00 for two years, $25.00 for three years. In Canada and Mexico, $12.00 for one year, $22.00 for two years, $31.00 for three years. Elsewhere $13.00 per year, payable in advance.

Single copies in U.S., possessions and Canada, $1.25. For subscriptions, address changes and adjustments, write to Analog Science Fiction/Science Fact, Box 5205, Boulder, Colorado 80323. Eight weeks are required for change of address. Please give both new and old address as printed on the last label. Postmaster: Send form 3579 to Analog, Box 5205, Boulder, Colorado 80323. First copy of new subscription will be mailed within eight weeks after receipt of order. The editorial contents have not been published before are protected by copyright and cannot be reprinted without the publisher's permission. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental. We cannot accept responsibility for unsolicited manuscripts or art work. Any material submitted must include return postage.

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ISSN0161—2328

POSTMASTER: SEND FORM 3579 to ANALOG SCIENCE FICTION/SCIENCE FACT, BOX 5205, BOULDER, COLORADO 80323.

Editorial and Advertising offices: Conde Nast Building 350 Madison Avenue New York, New York 10017

Subscriptions: Analog Science Fiction/Science Fact. Box 5205 Boulder, Colorado 80323

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20 JULY 1969

They made it, we all made it, just a bit,
like vikings leaving runes and little more,
taking the lesser light where God placed it
to show ourselves just what a heaven's for.
They loped like diving suited kangaroos
over that serile world of one night stands,
driving moon bugs and golf balls to amuse
the children, while the stars slipped through our hands.
They're gone now to their shrinks and shrunken space
The praise is theirs: it's ours to wonder why
the world's still flat, and dreams are out of grace.
So I, believing less each summer, pry
open that lost last year to see the bright
earth jewel smooth and blue in velvet night.

W.W. COOPER

ROBERT McCALL

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TEN YEARS AFTER: WHERE DO WE GO FROM HERE?

by Stanley Schmidt

Where were you on the night of July 20, 1969?

Many people remember where they were when they heard the announcement of Pearl Harbor or the Kennedy assassination; most of us probably remember at least as vividly where we were and what we were doing when men first walked on the moon. I was in the television lounge of a graduate student residence in Cleveland, and I was there for a far larger part of the day and night than I would normally have spent in front of a television set. For me—and probably for you—it was a moment of triumph, even if the triumph lay only in being able to say, "I told you so!" to those who, not long before, had laughed at any suggestion that this would ever happen.

Now what?

Neil Armstrong's "giant step for mankind" was—or should have been—not the last step of a journey, but the first of a still larger one. Three years later, I watched—this time not on television, but from a ringside seat—the end of an era. In the middle of a week which still doesn't seem quite real, I waited with thousands of others on a grassy shore in Florida while heat lightning flickered menacingly on the horizon and engineers and technicians raced time to fix the glitch that had delayed Apollo 17. After several hours, it finally went, in a spectacle of light and sound I've never seen matched, before or since.

The last Apollo was on its way—and no human has set foot on the moon since it came home.

Soon—hopefully—the space shuttle will be operating, beginning to open up space to something more than spectacles and tentative exploration. But the government space budget has suffered cut after cut, and so far private enterprise has received very

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little real encouragement to get into the act.

Maybe, gradually, the shuttle and some of the other projects now in the works will get things going again—and that, in the long run, is vitally important. Space will not solve population problems on Earth, but it will do many other things, perhaps the most important of which is opening up a diversity of options and opportunities to our species. "The Earth," as Robert A. Heinlein observed, "is just too small and fragile a basket for the human race to keep all its eggs in."

It's sometimes been said by opponents of space programs that the funds used in space are more urgently needed for other purposes on Earth. Space, they say, can wait. But can it? A few years ago I wrote a story ("The Unreachable Stars," Analog, *April 1971) about a future in which these people had had their way—and man had painted himself into a corner. When he really* needed *to expand into space, he was no longer able to do so. It was not a pleasant story to write—because it was one of the few in which I had the nagging feeling that maybe, in spite of myself, I was actually being prophetic.*

It could happen. Maybe we'd better make sure we take the chance while we have it.

Twenty, thirty, or forty years ago, we (or those who preceded us in science fiction) weren't kidding about man going to the moon. Now we're not kidding about the stars.

But will we take the chance—or throw it away, possibly beyond reach?

The answer depends, ultimately, on public support for the things that can be done in space. This commemorative issue of Analog *contains two special features which should be of interest to every reacher interested in these questions. "American Enthusiasm for Space Flight," by William Sims Bainbridge and Richard Wyckoff reports and interprets some findings about just how the public feels about space, and why. Some of them may surprise you—but they're certainly things you should know about if you're interested in* influencing *those attitudes in the direction of action.*

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Our other special article addresses itself more specifically to exactly that problem. You, Analog's *readers, are a very special subset of the public. Most of you have long been interested in the exploration and development of space. But what can you* do *to make sure those things happen? Art Dula's "Getting Involved in the Future" is a miniature "how-to" manual, a guide to specific sources of information and specific actions any interested citizen can take. There's a certain amount of inevitable overlap—you'll see why—but each article offers its own special information that should help ensure that this show stays on the road.*

But the information, please note, has to be used *to be useful.*

The ball is in our court. ■

GETTING INVOLVED IN THE FUTURE

by Art Dula

What can you do to see man expand into space?

A powerful prospace movement has evolved since America's last manned space flight. Individuals and groups have initiated a sequence of events that will inevitably make revolutionary changes in our lives. Within a year the Space Shuttle will begin service as our first reuseable spacecraft. Cheap routine access to space will begin the age of space industrialization.

This article is your citizen's guide to a new frontier. It tells what's happening today and how you can become involved in shaping the future. By 1985 we could have profitable space industries. In a decade, by 1990, you could be living and working in space.

There is one prerequisite. The public must be swayed. They must be educated. If you sincerely want space to be part of your future, you personally must assume responsibility for educating the public. Your task has two parts. First, to teach others, you must have knowledge. Second, you must effectively use your knowledge to influence others.

KNOWLEDGE

Students, especially high school students, should rigorously prepare themselves to be active participants in space industry. They must study science and mathematics. College students should major in engineering, math and science, i.e., the "hard" majors. Graduate work can be in business management, law or advanced technical and scientific subjects. Learn how to think. Formal education only gives you tools to educate yourself. Math, engineering, business management, economics, law and other subjects will form a framework on which to build new disciplines to deal with the new environment of space. The really

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worthwhile uses of space will be discovered only through research done in space.

This should not downgrade the importance of a liberal education, but more engineers than historians will be in the first wave to settle the high frontier.

Formal education is not enough. You will also need to be aware of new developments in space related areas. Fortunately a number of organizations, many of them only a few years old, exist to provide you with this information. This communications infrastructure is growing rapidly, over *100 percent per year, so the following* list of organizations is undoubtedly incomplete, but should serve as a starting point:

1. The L-5 Society
   1620 N. Park, Tucson, AZ 85719
   Formed in late 1975, the Society now has over 3,000 members in 30 local chapters. *The L-5 News,* published monthly, is a mixture of technical articles and political information. The Society is politically active. A legislative information service and a Washington liaison office keep members informed of current events. Membership is $20.00, student membership is $15.00.
2. The American Institute of Aeronautics & Astronautics
   1290 Avenue of the Americas, New York , N.Y. 10019. The AIAA is the professional society of the aerospace industry. It publishes several technical journals, including a monthly magazine, *Aeronautics & Astronautics.* The Institute has a student division with its own publication and holds both a comprehensive annual meeting and many special technical meetings.
3. The American Astronautical Association
   6060 Duke Street, Alexandria, VA 22304. The AAS developed out of the American Rocket Society. It is very professional and more space oriented than the AIAA. It holds wonderful and stimulating annual meetings. The meetings are quite inexpensive. Students can get in free at times. Some *of the soundest technical papers on* space industry and the future come from the AAS and its many working groups are always receptive to new ideas. The current president, Charles Sheffield, a SF writer, is actively trying to involve the association in new ventures.
4. The National Space Institute
   1911 N. Fort Meyer Drive, Suite 408, Arlington, VA 22209. Formed by the late Werner von Braun, among others, the NSI recently benefitted from a major transfusion of cash donated as part of a court settlement. The Institute has around 8,000 members and publishes a newsletter.
5. The Space Studies Institute
   Box 82, Princeton, NJ 08540
   Founded by Gerard O'Neill, SSI is a research institute at Princeton. For a reasonable contribution of $15-$25 you will get on their mailing list and receive newsletters.

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6. The National Space Club
   1629 K Street, N.W., Suite 700, Washington, D.C. 20006. The NSC is a group of aerospace executives who, among other things, give scholarships. They don't appear to have a newsletter or seek members.
7. The Sunsat Energy Council
   600 New Hampshire Ave., Suite 480, Washington, D.C. 20031 Formed in 1977 by Peter Glaser, the inventor of the solar power satellite, and a group of individuals representing aerospace industry, labor, power companies and universities, the SEC exists to foster a nondepletable energy source for the future. There are now over 100 corporate and individual members. Individual membership is $15.00.
8. The University Space Research Association
   Box 903, Columbia, MD 21044 USRA is a group of universities that cooperate on space research. The Association does not have individual members, but does help researchers and students who are interested in space.
9. The Lunar & Planetary Institute
   3303 NASA Road One, Houston, TX 77058. Funded by NASA, LPI has an enormous store of information for researchers interested in the moon and planets. It publishes a very useful free newsletter and space manufacturing, use of lunar glasses, etc.
10. The National Action Committee For Space
    POB 5001, Washington, D.C. 20004. This is a young political action group with several hundred members in chapters scattered all around the country.

If you want to be a part of the current intellectual ferment that will shortly become a dominant theme of our time, write to all these organizations, it will cost you less than $2.00, then join and work with those you feel will best help you reach your goals.

Since it's unlikely that I know all space-oriented groups, I apologize for my oversights and suggest that other groups write letters to Analog describing themselves.

There are two other sources of information that should be mentioned. First, NASA has a public information service. Write to NASA Headquarters, Washington, D.C. 20546 to be put on their mailing list or to request specific information. Second, *Aviation Week & Space Technology,* POB 503, Hightstown, NJ 08520 ($33.00 per year), is a unique weekly journal that contains virtually all current space and aerospace gossip, as well as hard news.

CURRENT LEGISLATION

When dozens of groups with thousands of members each spring up virtually overnight, the potential exists for vast political change. Some farsighted senators and representatives with their ears to the ground and fingers in the wind (try working in that position) have introduced legislation to guide our transition to a space-based economy.

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Last year Ron Flippo (D-Alabama) introduced a bill that would have funded space solar power development. It passed the House by a 3 to 1 margin, but failed in the Senate. Late in the last session of Congress, Senator Stevenson (D-Illinois) introduced a Space Policy Act, but it also failed to pass.

These bills focused on Congress' longstanding discontent with the current administration's space policy. Early in this current term, four space related bills were introduced. Most, if not all of them, will pass if you give them your active support.

1. The National Space and Aeronautics Policy Act of 1979
   S-212 (Schmitt, R-New Mexico) Introduced January 24th, this bold act sets comprehensive future policy goals for U.S. space activities. Senator Schmitt, the "last man on the moon" from Apollo 17 and a Ph.D. geologist, has clearly defined a series of steps, funding proposals and guidelines which will keep the U.S. number one in space. The bill has been co-sponsored by nine senators.
2. The Space Policy Act of 1979
   S-244 (Stevenson, D-Illinois) Introduced January 29th, hearings have already been held on this bill. It proposes a ten year program including a world-data network, prototype space power system and specific space science goals.
3. The Solar Power Satellite Research, Development and Evaluation Act of 1979
   HR-2335 (Flippo, D-Alabama) Introduced February 22nd, this bill provides a specific development program for space solar power. It is similar to the bill that overwhelmingly passed the House late last session.
4. The Space Industrialization Act of 1979
   HR-2337 (Fuqua, D-Florida) Also introduced February 22nd, this bill is the most important space legislation now pending in Congress. Rep. Fuqua is the powerful chairman of the House Science and Technology Committee. His bill provides a series of very rational economic incentives designed to promote the development of space industry.

You can order copies of these bills from your representative or senator or by writing to the Commerce Committee of the Senate or the Science and Technology Committee. You should study these bills carefully because they may well be the law of the land in a few months.

SPS INFORMATION

The next really large space project will be the Solar Power Satellite (SPS). It is the one endeavor large enough to yield significant economies of scale in space that also is capable of returning a real profit. (Did you know we spend over $25 billion a year for new electric generators and over $55 billion a year for electric power?)

Getting data on SPS is tricky. The Department of Energy (DOE), not

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NASA, is in charge of SPS. DOE has just published a summary document, "DOE/ER-0022 Satellite Power System Program Summary." It can be obtained by writing: U.S. Department of Energy, Assistant Secretary of Energy Research, Satellite Power System Project Office, Washington, D.C. 20545.

This summary describes recent technical and social studies of SPS. Everything from societal acceptance to bioeffects of microwaves is covered in a series of studies and white papers that you can order from the summary.

Finally, the Graduate School of Business Administration DJ-10, University of Washington, Seattle, WA 98195, has published a special issue of The Journal of Contemporary Business entitled, "Enterprise on the Enterprise—Industry, Government & Space Industrialization" (it costs $4.00). This single volume covers everything from "Space Law for Business Planners" to how to contract for Shuttle services. Its fourteen practical articles are an excellent introduction on how business will be conducted on the Shuttle.

HOW TO WIN CONVERTS AND INFLUENCE VOTERS

Now that you have the information and are plugged into the system so you'll stay abreast of changes, what can you do to make things happen? The answer is simple. You must influence people.

This doesn't mean you have to influence everyone, just convince your friends, neighbors and business associates that space is good for their personal futures.

Of course you should ask your senator and representative to cosponsor or support bills that would establish long-term space policy goals and encourage development of new space systems. Generally a well-informed letter is most effective. An excellent guide, "Lobbying for Space —The 1978 Space Lobbist's Handbook" is available from Space Incentive, POB 353, Santa Clara, CA 95050, for $4.20. This comprehensive booklet gives detailed instructions on how you can be most effective with a single letter or an organized campaign. It also provides a complete record of all votes on space issues by all our representatives and senators.

To convince people of the value of space activities, you must appeal to their self-interest using arguments that will persuade them. This immediately frustrates most scientists, at least when they are talking to laymen. You must communicate clearly, not be condescending, and must relate your message to your audience.

A word of warning. Many of us feel space colonization, i.e. people living in space full-time, is the ultimate purpose of the space program. Unfortunately, this concept is beyond the conceptual framework of most people. A survey of reasons for public support of the space program done by the University of Washington gave the following as the twelve most important reasons the general public supports space activities:

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1. Radio, telephone, and TV relay satellites are vital links in the world's communication system, fostering education and international understanding.
2. Space exploration adds tremendously to our scientific knowledge.
3. Earth resource satellites allow us to monitor the natural environment of the Earth and help locate valuable resources such as minerals and water.
4. Meteorology satellites aid in making accurate predictions of the weather.
5. Space technology produces many valuable inventions and discoveries which have unexpected applications in industry and everyday life.
6. Navigation satellites are a great help to ship and plane navigators, and traffic control from space can aid safe and efficient use of conventional transportation systems.
7. Space development will give us new practical knowledge that can be used to improve human life.
8. Space will be of value in ways we cannot yet imagine.
9. Space can provide a focus for increasing international cooperation leading to world unity.
10. Electric power generated in space and sent down to Earth will help solve the energy crisis without polluting our environment.
11. Military reconnaissance satellites (spy satellites) further the cause of peace by making secret preparations for war and sneak attacks almost impossible.
12. The space program encourages young people to choose careers in science and technology, and is itself a good training ground for scientists and engineers.

The least popular reason in the whole survey was the human colonization of space and the development of a truly interplanetary society. This really turns a lot of people off. You should sway your audience, not whiplash them. The colonies will come.

Once you command the facts and can convince your friends, you might consider speaking to groups about space. Your union, church or professional society will give you a ready audience. Perhaps you could talk to a school class or work with interested students in a "space club."

Every city has a Chamber of Commerce which maintains a list of social and professional groups that meet regularly. Examples are the Lions Club, Kiwanis, Homemakers' Clubs, etc. Many of these groups have a hard time finding interesting speakers for their meetings. If you are ready to spread the word, work up a talk and send a letter to each club on the Chamber's list. This tactic has supplied me with audiences for three years—it will work for you, too.

In conclusion, if you want to go to space, it's your personal responsibility to do all you can to make the future happen. Only our combined action this year, this month, today, can make it happen. I urge you: "Make no little plans. They have no fire to stir men's souls. Reach only for the Stars."■

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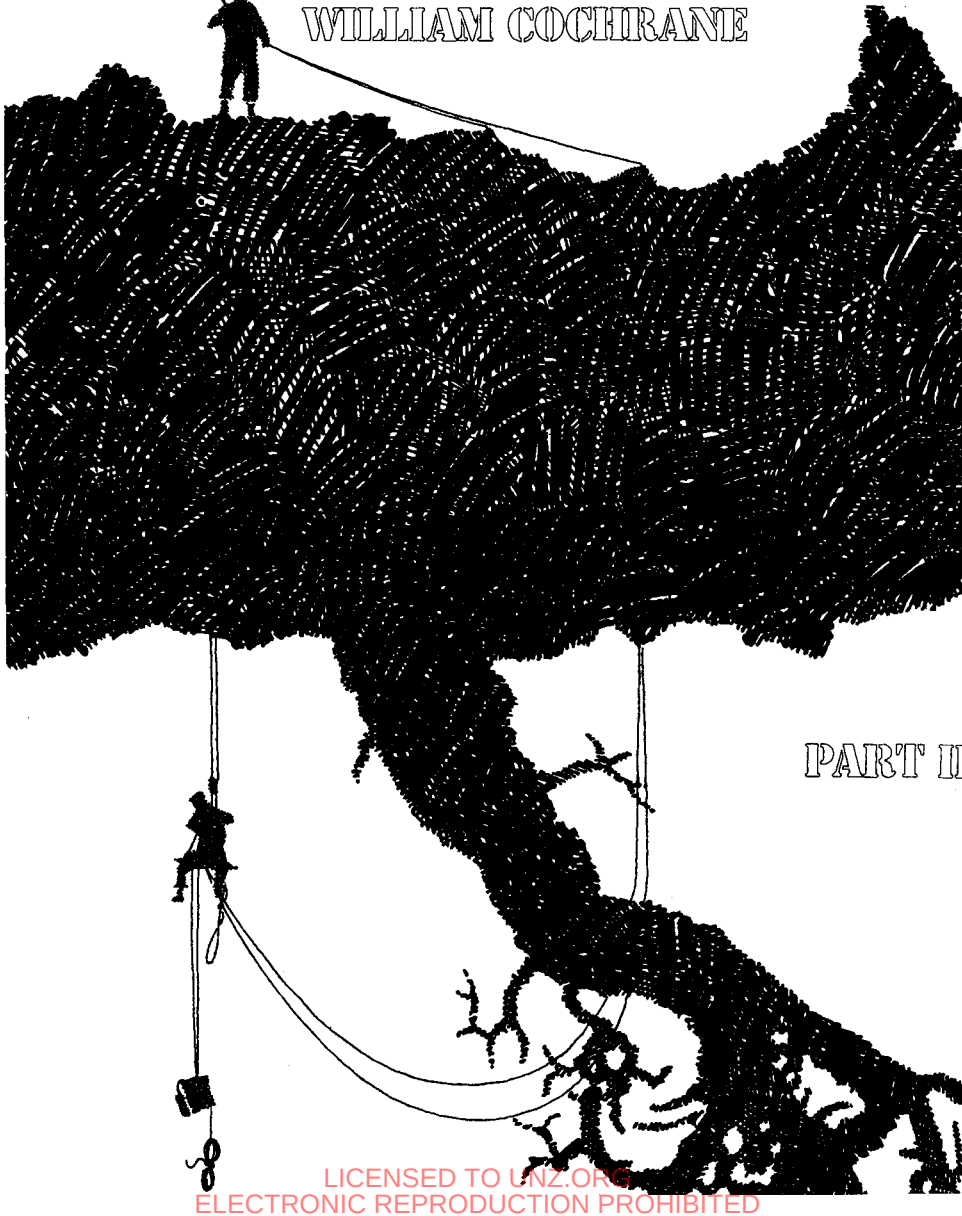
CLASS SIX CLIMB

There's a saying that you'll learn more about a man in two days on a climb than in two years in civilization. And the things people seek in climbing are as diverse as the people themselves.

WILLIAM COCHRANE



PART II

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Broeck Steadman

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SYNOPSIS: PART 1

The planet Kyle Murre *is a carefully protected primitive planet; protected for the welfare of its native population and the preservation of a species of long-lived, very large trees. This protection is maintained partly by Naval surveillance but mostly by means of an exclusive recreation club, the Taansvaal Sporting Club. The TSC is a Master's Class mountaineering club whose Lodge on* Kyle Murre *organizes and provisions climbing expeditions up the towering forty-six hundred meter Giant Tree of* Kyle Murre.

Admiral Gregarson, Chief of Space Operations, learns of plans to create a political incident on Kyle Murre *in order to break the TSC's exclusive charter and open the planet. As part of a counter operation, the Admiral plans to send a covert team of Master's Class mountaineers to* Kyle Murre *in order to have someone available if climbing skills are needed. These recruits must have the required climbing background and records—civilian mountaineers, rather than Mountain Marines, who would be most likely to be invited to come to* Kyle Murre *for only one serious purpose: mountaineering's most unique climb, the living Tree of* Kyle Murre.

"Doc" Eldon Barr is an anthropologist who combines mountaineering with his career and has to be recruited by a Colonel of the Mountain Marines who arranges an interview at the cliff-dwellings on Doc's near-inaccessable dig-site. Doc Barr is as impressed by the method used to recruit him as he is by the reasons the Colonel states to explain why Doc is needed on Kyle Murre. *Doc is told about Brigade Captain FitzRoi, who has been sent to* Kyle Murre *to provoke riots, and about another Master's Class mountaineer, Jessica Van Horn. Jessica Van Horn is a wealthy industrial administrator who has been invited to* Kyle Murre *to climb. Doc Barr is asked to be one of a civilian climb party that will go to the TSC Lodge and insure that no accidents happen to Jessica Van Horn on the climb. FitzRoi could use such an accident to provoke his riot and the incident. Since Doc Barr is a Master's Class climber and can fully appreciate the chance to make* Kyle Murre's *unique record climb, he accepts the job.*

The Colonel of the Mountain Marines, next recruits Jessica Van Horn for the climb party by posing as an agent of the Taansvaal Sporting Club and delivering her a gift invitation to come and climb the Tree. Jessica, also a Master's Class mountaineer, finds the once-in-a-lifetime climb at Kyle Murre *irresistable and accepts the invitation.*

The third member of the party, Arden Barth, is a professional guide, somewhat down on his luck. He is given his invitation to Kyle Murre *by a female client after he takes her on her first initiation climb to a mountain top.*

The three climbers, Barr, Van Horn, and Barth arrive at Kyle Murre *and find that they must face a two day*

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acclimatization period before the TSC will let them do any climbing. Also the fourth member of the climb party, Captain FitzRoi, who arrived a day earlier, is already making himself obnoxious to the staff and the native guides of the TSC Lodge. Captain FitzRoi has made it clear to everybody around him that he came to Kyle Murre *to climb the Giant Tree alone—solo. He resents being included in a party.*

The solo climb is against TSC policy and against the quasi-religious custom of the native guides who endow the giant Tree with great powers. Captain FitzRoi is not using this solo climb as the "incident" required by his Admiral. The climb is something personal concerning his mountaineering skills and reputation and the ranking of the giant Tree as the ultimate, unique, climbing experience. FitzRoi wants to climb solo and attempts to disrupt a planning session, but is stopped by the Director of the TSC Lodge, John Bryant, who also tells FitzRoi that he can't climb solo. Then, almost as an apology, Bryant also tells FitzRoi that he also can't leave Kyle Murre.*There has been a space accident, out-orbit. The Space Marines are tracing the radioactives, but* Kyle Murre's *spaceport is not accepting any traffic. Thus Director Bryant, indirectly tells FitzRoi that the support he expected may not be coming.*

But FitzRoi misses the message in his anger at not being allowed to climb. He is concerned with planning a way to achieve that solo climb as he takes a rollogon-truck and goes into the forest to get away from the TSC Lodge. There, in a forest grove, he comes upon a small tree which is guarded and protected as a Sacred Tree by Kyle Murrian Tree Guardians. FitzRoi, still angry at the TSC and all things Kyle Murrian, drives his rollogon straight at the native Guardians and the grove tree. The Guardians fire on him with crossbows and drive him off.

One of the Guardians is J'Gween, the Kyle Murrian climb guide who has been contracted to take Barr, Van Horn, Barth, and FitzRoi up the Giant Tree. Using signal drums, J'Gween warns his fellow Guardians about the threat to the Grove Tree and the identity of Captain FitzRoi as one of the climbers. Since FitzRoi is a climber, the Guardians will do nothing about his damage at the grove. They will leave that to the power of the Giant Tree.

J'Gween goes to the Lodge to meet with Doc Barr, Jessica Van Horn, and Arden Barth and to show them a first morning view of the Giant Tree that they are going to climb. Because of the fogs this is the first sight they have had of the Tree and they are profoundly impressed. For the first time they see the true size of the living Tree at its base and the climb routes up the rough crevasses and folds of bark. Routes which they must follow when they begin the climb tomorrow. This is the Giant Tree of Kyle Murre... *Tomorrow... They will all climb that...*

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7

FitzRoi walked into his room and released his stiffly-held calm in a burst of energy against an entryway table, kicking it away from him, then diving after it and smashing it back against the two-step platform of the entry—smashing and pounding until he held two shattered table legs and his breath was grating out of his mouth in wordless sounds.

Corporal Anderson, FitzRoi's dogsbody/batman, threw himself away from the table, and rolled over the back of the couch module, in a combat-reflex reaction to the violence of FitzRoi's movements. When he saw that the Captain was demolishing the table and not likely to start throwing things, Anderson eased himself over to the bar and began mixing two drinks—a double for the Captain, and one very light (he wanted to stay sober) for himself. As he mixed, he was listening to FitzRoi's swearing; sorting out the monologue to tell him what was wrong this time.

Something else to do with this Climb Lodge again, Anderson decided, mixing slowly, as he found the bottles. They've been telling the Captain he couldn't do thing since he got here. The Captain doesn't take to people telling him, No. . . . sure not as often as these Lodge-types do.

"They chased me out!" FitzRoi was saying between smashing and swearing. "Run-off like a... And shot at! No warning, Shooting at me! Right at my head. Damn, I was supposed to start an incident, but the Admiral didn't mean to get shot at."

The blood pressure beat against the back of his eyes. He swayed on his feet, his mind darkening to the world around him, remembering only the Admiral's Fleet cabin...

In the Star Admiral's cabin FitzRoi had been shown part of a battle plan that was almost as detailed as the climb plan he'd outlined to the Club Secretary Leighton. It was a division guerrilla operation, not the usual work for an Admiral, and FitzRoi was further annoyed by the small part he had to play—infiltrate and start a native uprising. The whole plan was fouled up.

"We have to send someone in who will be believeable," the Admiral had said. "You are the only Master's Class climber available in Procyon's Star Service. Your rank is superior to ordinary agent's work, but this is not an ordinary agent's job. None of our agents possess the mountaineering credentials to climb *Kyle Murre's* Tree, to begin with. That is going to be your cover. You are going to *Kyle Murre* in order to make that climb. Does that sound like an acceptable cover for *Kyle Murre?*"

"Yes, sir. One goes to *Kyle Murre* to climb the Tree." FitzRoi said dryly. The Admiral's ignorance was astounding. *Kyle Murre* was the lifetime goal of every serious mountaineer; the ultimate. Mission timetable, invasion fleet, or whatever, FitzRoi knew that he would find time to make that climb—before duty, if necessary. "That's what they are

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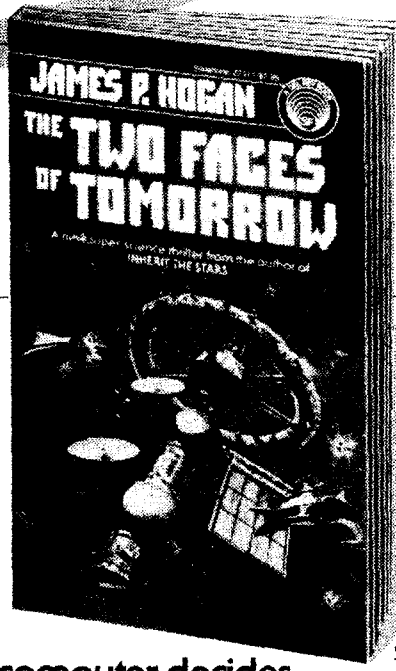

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noted for." He finished the understatement.

"Good. There is a climbing party already organized. You are to join it in sixteen days," the Admiral said. "Once you have established your cover, you will wait until my fleet provides you with an incident. There will be a space accident and I will rush my ships out to the rescue.

"At that point, I want a complete native uprising on *Kyle Murre.* I want a breakdown of local communications, strikes, burning of buildings, atrocities...whatever you can contrive. You understand?"

"Enough so that the Sporting Club cries for help also," FitzRoi said. "I understand perfectly."

"Exactly. I will immediately land the XXI and IX Regiments of the Survivor Division to maintain order and to evacuate all noncombatant civilians."

"The entire Sporting Club management staff, of course," FitzRoi said. "Except those regrettably killed by the natives."

"Or the subversive underground which we will have to track down and execute. But that task may take years. Our Procyonian military governors will have a very difficult time, I'm afraid."

"You hear me loud and clear, Mister," the Admiral's voice became rigidly stern. "About your job. You give me the incident, FitzRoi, and I'll have the planet. Understand?"

"Aye aye, sir," FitzRoi had said, loud and clear. *But I'm going to climb the Tree first, Admiral. And the hell with you,* he had said to himself.

He was still saying it.

"I'm going to climb that Tree. They can't run me off of that. . . . All I need is a good riot."

FitzRoi stared down at the wreckage of the table, lifted one of the broken legs, then slowly put it down. He stood up and was motionless for a moment as he thought deeply about something, then he said: "They were guarding something. What? That tree in the middle of the clearing? Of course!"

He looked down at the wreckage of the table, lifted the splintered table leg he'd been holding clubbed in his hand and stared at it—as if just seeing it. "A club. I found a club. Damned if I didn't!" He laughed loudly and tossed the broken leg on the pile of wreckage and turned toward the bar.

"They've given me a weapon, Anderson," he said, laughing again. "The squirrel-faces showed me a tree they want to protect. So, that's the one I'll use to force them to let me make my solo climb. No more arguments and plan changing to fit their silly rules. I've got a weapon." His voice was strong and clear, the madness of his anger wiped away. He took the drink and tipped it up thirstily. "I'll use a tree to help me climb a tree," he said. "The fuzz-tails won't be able to stop me. And they won't let the Lodge-stupids interfere either. It's a good plan.

"Did all our gear get here?" He lowered his drink and snapped the

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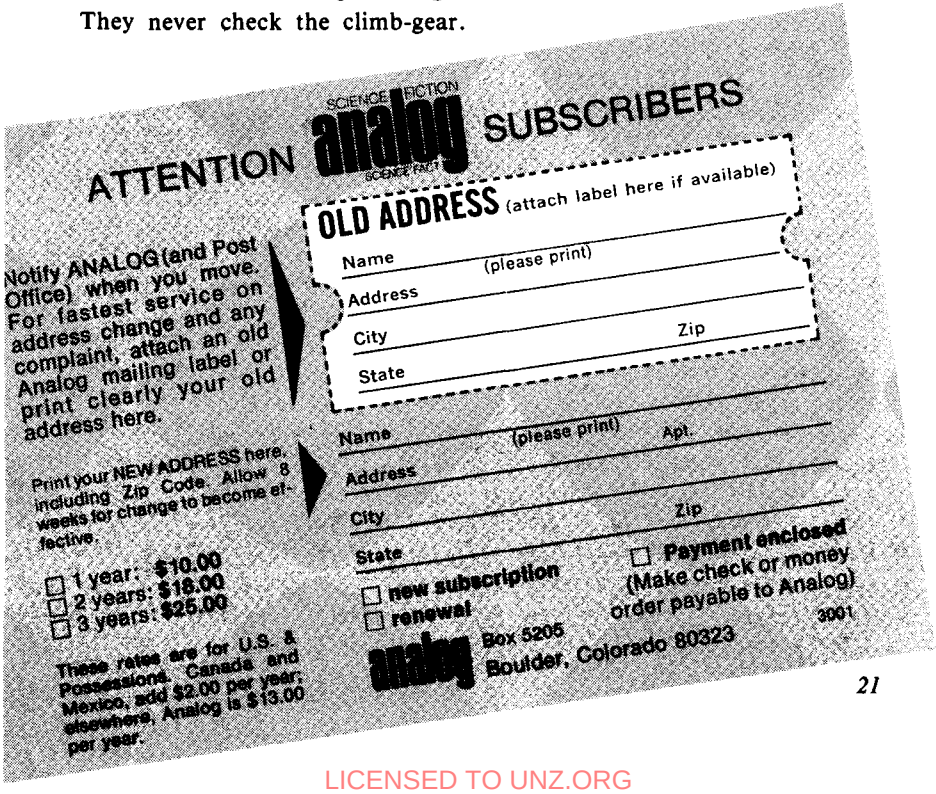
question at Anderson.

"Yes, sir," Anderson hadn't had time to touch his drink. "I was just checking it."

"Well, get it unpacked, man!" FitzRoi strode over to the pile of climb gear stacked on the floor. "Open all the *specials.* We have a lot of work to do tonight. I've got to set the trap and get back out to the climb-site by sunrise. Come on, man! Get to work!"

He crossed over to the pile of equipment and rummaged until he found a piton hammer with a special mark on the handle; one of his *specials.* He found another marked tool.

"Here's everything I marked," he said. "I knew it would get through. They never check the climb-gear. Come on, Anderson. Find the rest!" He had brought more equipment than he would need in order to cover and disguise two efficiently packed kits containing the actual gear for his solo climb. Also hidden in the over-supply were specially marked items that would let the two of them, he and Anderson, operate as a two man sabotage commando. The equipment was disguised and incredibly compact, built into standard appearing climb gear, like the piton hammer. He unscrewed the handle and tipped out two cylinder-charges of TBA. Anderson joined him and they began dismantling the equipment. When they were finished they had a neat pile



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of explosive charges, three miniature radio detonators; two gas powered needle pistons, and a firing transmitter for the detonators. Anderson completed the assembly of this last transmitter, except for the power cells.

"The PC cells slip into coin-slot clips, sir," he said.

"Let me have that," FitzRoi said. "I'll carry it. Now, pack that stuff in two shoulder packs and we'll get going. You carry the detonators, since I've got the trigger-transmitter."

"Right." Anderson picked up two small bags and packed the explosives. He took a little more time with the detonators and got a, "Hurry up!" from FitzRoi who was halfway to the door.

"Captain," Anderson said, swinging the pack on his shoulder. "What are we going up against? You said they shot at you. These needle pistols only have knockout darts, you know." He was checking the magazine load as he spoke.

"A walk-in-the-woods. Just a walk. These needles," FitzRoi held up his pistol, "these needles have a specific coating for the Kyle Murrian fur-heads. I had them made up special. Besides, I have three clips of explosive loads in case we meet anything heavy. But we won't. Five fuzz-tails armed with crossbows is all I expect." He holstered the pistol, dismissing the opposition with a shrug. "You were with me on Terthilla VII and I know how good you are in the jungle, so don't worry. They won't even see us, Corporal. Hell, I could take them with a green recruit backing me!

"Now, move it! Bring that other pack," FitzRoi picked up a tightly-packed rucksack that they hadn't opened, one of the two packs he didn't have to open—his personal climb kit. "The one with the standard climb-gear and rations, then let's get out of here. I still have to kidnap that dumb guide, H'Reeh, yet, and then we have a long drive ahead of us."

"Drive? Kidnap?" Anderson hooked a hand in the shoulder straps of the pack FitzRoi had indicated. The Captain was moving a little fast for him.

"That's what I said. Come on, Corporal. I kept the rollogon on reserve—fueled and ready. You'll drive and back me up. I'll do all the rest, so explanations won't be necessary. Get moving, man!" FitzRoi slid the door open and went out, expecting Anderson to follow him closely.

Anderson shrugged, holstered the needle pistol to have his other hand free for the climb-pack, and cat-footed after his Captain.

FitzRoi came back to the Tree Grove in a completely different manner than his last trip. The bluster and stiff military superiority he showed around the Lodge were gone. He was wearing dark climb-clothes and moved through the trees and brush on foot, effortlessly and silently; a professional, working at his trade.

"Five guards," he said subvocally. "See them?"

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"Affirmative," Anderson's voice answered in his ear, The Corporal was wearing snooper glasses too, the heat pattern of the Kyle Murrian bodies was plain even through the trees and brush.

"Take the three on the right," FitzRoi ordered. "Work wide, they're bunched," He began to move himself, to the left, headed for the other guards. The forest growth wavered and went back to its original position. He didn't crush any undergrowth this time and entered the Grove perimeter unnoticed.

The Kyle Murrians were at a disadvantage. This was their home forest; each tree and bush was a friend, and they knew every sound. FitzRoi and Anderson were combatmen in a strange forest; each tree and bush was their enemy, and they made no sounds.

FitzRoi heard the coughing spit of Anderson's pistol between his own first and second shot. He didn't hear the sound of any of the crossbows, so he assumed that Anderson's marksmanship had been as accurate as his own.

"What now?" Anderson's voice asked.

"Let's see if there are any more around," FitzRoi said. His snooper goggles had told him the area was clear, but there was one other way to find out. He stood up and walked into the clearing.

Nobody shot at him, so he continued on to the young tree in the center of the grove, flicked up his goggles, unslung his pack and began placing the explosive charges around the roots.

"Captain," Anderson's voice called. "These natives are dead."

"Bring the detonators out here," FitzRoi said. "I'm ready for them, now."

"They're dead, Captain. You said these were knock-out needles."

"Forget about the squirrel-faces! Get out here with the detonators!"

Anderson didn't reply, but presently he was walking toward FitzRoi, making obvious step noises with his feet, so he wouldn't startle the Captain into any sudden shooting.

"Now, go back and bring the rollogon in," FitzRoi ordered, taking the pack. "I want that guide, H'Reeh, to see what I'm doing."

Anderson looked at his Captain steadily for a minute, waiting for some further explanation of the dead Kyle Murrians. When he didn't get one, the Corporal turned and walked away into the dark.

FitzRoi smiled thinly at the placement of his charges. The Outstar Marines thought they were so clever, blockading *Kyle Murre* with that phoney story about radioactive dust. Well, the Admiral's reinforcing ships could sneak past the Marine blockade or they might get even get caught trying. That didn't matter because he, FitzRoi, was already here on the planet. And this little trick, with the Kyle Murrian God Tree would turn the fuzz-tails down. He'd seen native populations explode before when

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someone whiffed their temples. The Lodge and the Outstar Marines would have a full revolt on their hands if this tree blew up. The threat of blowing it up would be enough to give the Admiral all the incident he needed. The fuzz-tails would go crazy when he threatened to blow it up.

When he threatened.... FitzRoi was going to use this tree first. Use it to buy enough time to make a solo climb for record on the great Tree of *Kyle Murre.* Maybe, after this job, nobody would ever again climb *Kyle Murre's* Tree. But FitzRoi was going to be the last—and the first to do it solo. A record that would always stand. No matter what!

He busied himself interconnecting the charges and the three detonators then setting up the antitamper circuits. He had to work precisely and, in some places, slowly, so he had barely finished when the rologon truck, its motor running in muffled-mode this time, throbbed into the clearing.

FitzRoi stood up and motioned the car to a stop at a distance and trotted over. "Kick him out!" he called.

Anderson helped the Kyle Murrian out of the cab. The guide needed help, his hands were covered with heavy canvas and taped together.

FitzRoi grabbed him by an elbow and jerked him across the space to the tree. H'Reeh stumbled, walking clumsily because his feet were taped in padded bags too. FitzRoi was taking no chances with the strong Kyle Murrian claws.

"Take a good look at this, Fuzz-face," he growled, pushing the guide to where he could see the tree. "I know you know what this is. This tree? Huh?"

H'Reeh's indrawn breath was loudly audible.

"Means something to you fuzz-tails, doesn't it? Well, take a close look at what I put on its roots." He shoved the guide down on his knees. "That's explosive, Mr. Guide. If it blows up it'll cut your pretty tree down like an axe.

"And see this..." He held the small transmitter box in front of the guide's eyes. "This is what I use to set it off. BLAAM!" He said the last loudly enough to make H'Reeh jump, then hauled him to his feet.

"And the only thing that's going to keep me from setting it off is you. You're going to guide me in a climb. Just the two of us." He laughed at the guide's frantic, *No-no-no* signals. "Shut up!" he said and held the trigger box up close to H'Reeh's eyes. "Yes, you will. Just the two of us. We'll leave right away and be climbing by first-light. And you're going to be a good guide too. If I slip, or fall, this will go off. If you guide me wrong, or you try to get lost until your people have time to find us... This will go off. BAAM! Understand?

"When we climb to the top and back down, you can have this trigger box all safe—as payment, Mr. Guide.

"And hear me good, Mr. Guide!" He whirled the native around to force him to see the explosively mined tree again. "Take a look at your tree, Mr.

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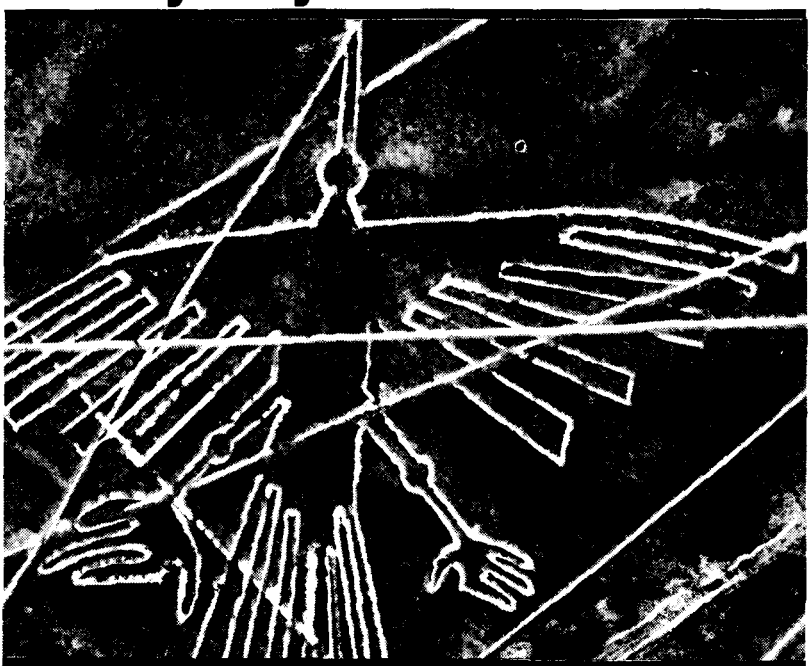

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Guide. Those explosives themselves are tricked up so that if anybody tries to remove them they'll go off. Nobody's going to bother us while we climb, are they, Mr. Guide? So you'll guide me good, won't you, Mr. Guide?"

H'Reeh, facing the treelet, began a low, four-toned chant. It was a simple tune, but as he voiced it the guide seemed to gather himself together. It was as if he realized for the first time where he was, as if he was alone with the sacred Grove Tree, singing to it alone. He straightened and seemed to grow taller.

"Made up your mind, Mr. Guide? You are going to guide me aren't you?" FitzRoi was completely confident.

"I will guide you, Ca'tn," H'Reeh said formally. Then he turned away from the Grove Tree, breaking FitzRoi's hold on his arm easily, and walked to the car. He stood waiting for Anderson to help him into it.

"He means it," Anderson said quickly. "He'll smash that tree to bits if you trick him."

"I have seen his eyes," H'Reeh said. "My promise keeps the tree safe. I will be a Grove Guardian, and if my promise will keep the Grove Lord safe, he has it. I will guide the Ca'tn well."

"Don't try any tricks on the climb," Anderson warned, hooking a hand under the guide's arm and helping him into the seat.

"What happens on the Tree is by the power of the Tree."

"I've set the antitamper circuits and pulled the trembler pins," FitzRoi said, coming up to them. "Haul us around and drive out of here. But go slow. Those A/T tremblers are live."

Anderson nodded and took the rollogon truck around in a short circle and back into the forest.

8

That afternoon the Lodge delivered the climbing gear to Jessica, Doc and Arden. The TSC enforced period of acclimatization was over. The Lodge policy was to return all climbing gear promptly and politely at the end of twenty-six hours, even though this might be after midnight or the small hours of the morning—they knew the dedication and impatience of climbers. In this case, not quite so radical, the gear was in their rooms when they came back after dinner. Stacked on top of the pile of ropes, rucksacks, and *anoraks* was a typed, duplicated, note from Captain FitzRoi:

TO: CLIMB PARTY M12A
FOR: EXECUTION BY 0445LPT CECCA/21/50.05 ASSEMBLE IN THE LOBBY WITH ALL GEAR FOR TRANSPORT TO CLIMB-BASE AT 0445 LOCAL SUNRISE. HARDWARE AND RATIONS WILL BE PROVIDED.
FITZROI

"With all the grace of a battle order," Jessica said, reading the copy on her pile. "Do you suppose we *did* sign enlistment papers in that nut's army?"

She tossed the note aside and stood

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looking at the pile of climb gear, her eyes widening slowly in excitement, her tongue wetting her lips along the inside of her makeup. Her climb-clothes always excited her more than any cocktail gown. Made to measure and well-worn on other climbs, she knew their fit and comfort. . . . but not for this Tree . . .Perhaps . . .

After a moment, a frown narrowed her eyes and, with quick, frantic movements, she threw off her dinner dress and put on all the climb gear—from the skin out, boots, jacket and *anorak*. Then she put in a steady, rhythmic half-hour duplicating the physical jerks she'd watched FitzRoi inflict on himself and the guide. Following this, comfortable in the fit of the clothes, she repacked the rucksack using quick, habitual movements to check its contents. Satisfied, she stripped, folded the clothes she would wear into a neat, boot-topped pile by the rucksack, stuffed everything else into her travel cases and went into the bath. In the rustic, tiled bath she showered, taking a long, hot steam with cold needles at the end, in anticipation of a week without bathing water. At the end, her body cleaned and relaxed, she came back to the bedroom—still nude. She would be living in her climb clothes for the week, too. She intended to let her body breathe as long as possible.

She closed and locked her travel cases, packing away her regular clothes until the end of the climb. One final glance at the climbing clothes laid out on the floor and she slid into the wide bed. Her mental preparations for this climb had been made long ago, she was untroubled by either nerves or an over-active imagination, and so she was asleep in moments.

Arden Barth also put on his climb-clothes, bent and swayed through his own ritual of checking their fit, his own imitation of FitzRoian physical jerks. Following that, he examined his rucksack, managing to pack it smaller and leave some space at the top. Then he lay on the top of the bed, fully clothed except for the foul-weather gear, and looked at the wall. He saw only the vista of the towering Tree and its veil of clouds projected by his imagination in place of the wall panelling, but he looked, and looked; sleepless, as the night passed.

Doc Barr felt himself untroubled by climbing nerves. He'd been on many climbs and this was just another one. His equipment was well used, where it had served him comfortably, and new, where safety demanded new gear, but both old and new stuff were as familiar to him as old friends. He spent the night packing and repacking his rucksack, coiling and recoiling the ropes. He repeated each action, because he honestly didn't remember doing it just moments before. The morning call surprised him, but his gear was all packed completely for the final time. His repeated packing had been clocked by some unconscious schedule, of which he was as ignorant as he had been of the passing hours.

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The morning call, when it came, was a pleasant, excitement-producing beginning to a day's climb. The three climbers met at the drop-shaft, laughed briefly at the sight of each other burdened and enwrapped with climb gear, then jostled happily into the cage for the trip down to the lobby. Their anticipation was making them all a little bubbly, even Doc.

When the cage cycled open on the ground floor they were stunned by the loud, violent drumming that was filling the lobby. Through the glass archway of the front doors the three could see a crowd of Kyle Murrians moving and surging in the garden area and out along the approach park. Two long drum-branches had been pulled up onto the steps and four natives were producing the mind-numbing pulsing sound wave that rolled and echoed through the lobby; drumbeats that the upper-floor soundproofing had blocked out.

A door opened at one side of the lobby hall and one of the Lodge staff—human—beckoned frantically and made the military hand signs for *run-run-run.*

Doc recognized the signal and took off, jogging as fast as the encumbering equipment would let him. A cold stiffness gripped the back of his spine, tightened his muscles. He'd almost forgotten that FitzRoi was under orders to sabotage and wreck the Sporting Club. All the soft living and good service at the Lodge had driven the idea of danger out of his mind. FitzRoi wouldn't be content with a quarrel about his solo climb and the sort of inter-spacial incident that the Mountain Marine Colonel had talked about. Wrack, ruin, and riot...that drumming was FitzRoi's style. FitzRoi had started his riot.

Doc managed a little more speed. He wondered how far away the Colonel's Marines were...

Arden gave Jessica a nudge, pointing the way to start her moving, and they both scuttled after Doc, out into the lobby and through the door into the Lodge's dining room. There they found all of the human staff gathered in tight groups around various tables, drinking *kaffe* and finishing breakfast. The mess hall atmosphere was highly incongrous after the near riot outside the front door.

"Bring 'em over here, Smithers," came a call. "Then scare up three more trays, will you. Make it four, man. I'm still hungry." the speaker was the aloof, and very large Director of the Lodge. Outside of the one time at the climb briefing three days ago none of the three had talked to him, but they all had seen him from a distance. He'd made his near-theatrical appearances at meal times in this same dining room; immaculately formal, eating alone in massive splendor. This time he wasn't eating alone, his table was covered with the scattered remains of many meals and he was surrounded by a group of worried looking men, the grey rectangles of a portable radio transmitter station, and two Kyle Murrians....the only two natives in the room.

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As Doc, Jessica, and Arden came closer, some decision was taken and half of the crowd gathered around the commcenter; the other half left the table, heading for the *kaffe* urn. The Kyle Murrians remained motionless behind the Director's chair.

The Lodge Director swung around and slid out two chairs, motioning them to sit down at his table.

"Sit here, please. All of you," he said. "And take off that clumsy gear for a bit." He wasn't being aloof now, nor immaculate. He wore a comfortably ancient coverall and a blue-black jacket. The jacket material also showed wear marks and its gold piping was tarnished until it nearly matched the material. But the two front creases were as sharp as they had ever been and there would be three equally pristine creases on the back of the jacket. This style of tailoring was still the distinction of an Outstar Marine uniform, even one as long out of service as the Director's.

"Brigadier General Bryant, gentlemen; Lady Van Horn," he introduced himself. "John Bryant, your host here at the Lodge, as you know. Brigadier General, retired, really, but military titles seem to be more in line with what we have on our front door, heh? Come on, sit down. Eat a little breakfast. It has always been my policy to feed my men before they go into a fight and it surely looks like we may have a fight, doesn't it? What do you think of my Command Post, heh? Got food and water and communications to the rear." He waved a hand proudly at the radio installation on the table. "All the essentials, for the moment."

"What the hell's going on... General?" Arden jerked out his own chair and sat down. "All those people...? That racket?"

"Your erswhile climbing partner, Captain FitzRoi..." General Bryant started to explain.

"I've got the spaceport, General!" the comm-operator cut in.

"Get a report! What's their situation? Any damage?" Bryant switched thought streams, waved an arm at one of the men by the *kaffe* urn. "Smithers! Take somebody with you and get over to my office. Open the gun cabinet and bring back the hunting kit. Here's the keys." He tossed them. "There's nothing there to handle a riot, but it'll make me feel better to have the guns in here. Go, man!

"You got that report yet, Hendricks?" He swung back to the operator. That worthy was already talking into his headset and shortly looked up to report.

"No damage, sir. But no Kyle Murrians either. They've had drum-talk since before sunrise and everybody took off—port workers, the tree-farmers, even the customs inspection crew—just left, walking. A copter followed them long enough to get a line on their march. They're headed straight here, down the coast. About one thousand or twelve hundred natives, sir.

"The Marines are dropping in a company-strength boat. They must

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have been expecting something because they are already in the atmosphere—ETA two hours to the port."

"Weapons?" Bryant snapped.

"Marines? You asking me, General? I hope they bring cannon."

"Not them. The Kyle Murrians? The port mob? Do they have weapons?"

The question was relayed and answered: "The Port doesn't know. They didn't break up anything at the Port, or take away any trucks. Just walked off.

"Sir, he wants to know what to do?"

"So do I. Damn, FitzRoi, he's turned the planet upside down. Humm. Well, the Kyle Murrians haven't done any damage here either, just that drumming." He thought a minute, then said. "Tell them what we know about the Sacred Grove, Hendricks. The Marines will want to know. Then have them call the Police Station, the Port transmitter has enough power to reach it. I don't need Marines here, but I do want Sergeant Burton and his native police. With the Sacred Tree in the picture Burton's native police are the only authority the Kyle Murrians will listen to. Tell the Marines I said to get that call off to Burton, then seal the Port. Nothing on or off until this Tree thing clears up.

"You set up an hourly check call with them, Hendricks, so that they will know we are all right. And don't miss a call, buddy boy, or we'll have Marines down our necks. Don't miss a time hack. That's why you've got two transmitters, there. Understand me?"

"Yes, sir. Spaceport calls Sergeant Burton, then pulls in their heads and sweats it out. Aye, aye."

"Twelve hundred...on foot...fifty kilometers... They'll be here tomorrow night or the next day. Humph! Have to do something before that...

"Look, here's what caused all the trouble." He turned back to the three climbers. "Captain FitzRoi took a truck out of here last night and killed five Kyle Murrians...."

In short, flashing sentences he told Doc, Jessica and Arden the extent of FitzRoi's crimes; told them while the breakfast trays were brought and he urged them to eat.

"So you see, it's the Tree, basically," he finished. "FitzRoi's attacked the religious aspect of the big tree and I'm sorry to say that he's managed to carry off something that we weren't prepared to handle. I've been running this Sporting Club so long that I began to think of the Tree as just a place for climbing—sport—not a god-object. Damn serious oversight. But the Kyle Murrians were always willing to let anybody climb it...."

"As long as you did it with respect and climbed properly," Doc said. "Why not? What's the phrase I've heard...*The way of the Tree.* But FitzRoi's way...like burning down the door of a church....What do you expect? They're angry and they will probably fight if FitzRoi does blow up that Grove Tree."

"What about the Outstar Marines?

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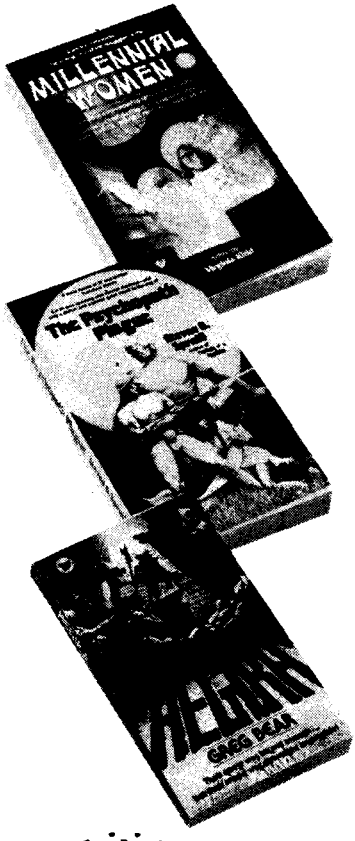

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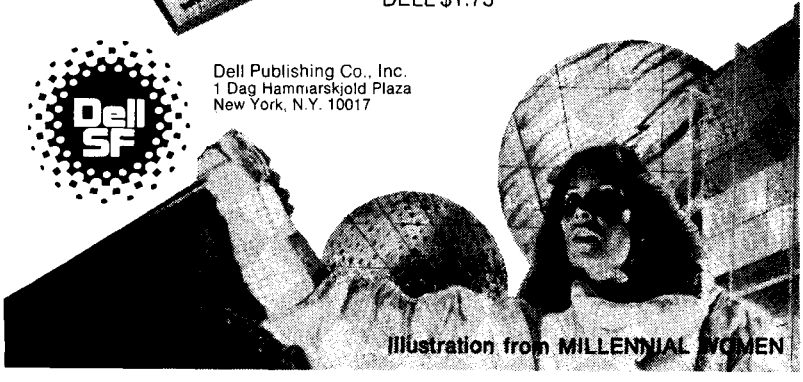

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Can you call them in to evacuate your staff?"

"I've been promised a company of Mountain Marines. Climbers who can work on the Tree as well as fight, but they will have to land at the Port and that's too far away. I can't have them making a beachead drop here in the trees. They'd do more damage than FitzRoi. That would be like using an axe to swat flies. The best thing the Marines can do is keep on mopping up that dust cloud, so I can get a passenger liner in here." General Bryant rolled the story about the dust cloud out glibly, but the lack of expression on his face confirmed Doc's belief that the story was mostly fiction. The Marines were probably very busy doing something else. "Best thing they can do is see that we're left alone. FitzRoi is our problem. If we can't solve it . . . well then. Afterward they can move in. FitzRoi's up to us, until then, damn it!"

"What do you intend to do about him, then, General?" Jessica asked. She didn't see any signs that this oversize TSC Director was going to give up his hotel and go away. On the contrary he seemed to enjoy playing soldier. "Or rather, what do you expect us to do about it?"

"Very quick, Lady Van Horn. Very quick. All right, I'll be equally quick and blunt. I've got a good staff here. They're all men and any man will fight like hell when he's scared and there's no place to run to. But that mob outside could roll over us like nothing... and the gang coming from the spaceport has enough hands to pull this hotel apart. The only way I can see to stop the Kyle Murrians is to get hold of FitzRoi and show them that we intend to give him over to the Kyle Murrian Police. I don't really care about that now. The point is: FitzRoi's on the Tree. This gang of mine is good at being cooks and bakers and at running this Lodge...and I know that they'll fight. But none of us can climb stairs worth a damn!

"FitzRoi is on the Tree. I want to send you three up after him, or rather, Leighton does. It's his idea, but its a good one. He pointed out to me that you are the only climbers that we have in the Lodge at this time. So. I will grant you temporary Police authorization and you can..."

"What about J'Gween?" Arden interrupted, pointing at the guide. "Can't you send him? Or is he a hostage?"

"Two hostages to hold back that mob out there." Bryant laughed explosively. "No way. No, J'Gween is still here as your climb-guide. He won't go get FitzRoi alone though, I asked him. As long as the Grove Tree is mined no native will work against FitzRoi. I expect that's what has kept them off of us, for that matter. Anyway, J'Gween won't go up against FitzRoi, but he will guide your party on a climb up the Tree so that you can catch him. Right, J'Gween?"

"The contracts have been said," J'Gween said, his ears twitching rapidly.

"Do you honestly expect us,"

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Arden looked quickly at Jessica and Doc, "to take on one of the top high-angle climbs in the record books... like a bunch of comic-tape cops...make this climb chasing a killer? What do we do when—if—we catch him, for Gods sake? Ask him to sign our climb book?"

"The contracts have been said," J'Gwen said, his ears twitching. rapidly.

"Might be the only safe place to be, if FitzRoi blows up a sacred Tree," Doc said laconically. He was remembering the Marine Colonel's word for FitzRoi's incident was *riot*. "We would be protected by the Giant Tree's taboo. I don't think anybody else at the Lodge would be protected."

"You think we ought to climb, Doc?" Jessica was a little amazed. The mob outside the Lodge, the drums, and Director—General—Bryant's warlike preparations didn't seem to call for time out for sport.

General Bryant said. "We've never found the Kyle Murrians to be a violent people...before this. But then, the Taansvaal Sporting Club was always careful to cater to their feelings about the trees. Damn, one look at that big monster out there and I feel like bowing to it myself. I haven't had a climber in here yet that didn't feel the same way sooner or later. They get very quiet, then there isn't anything in the world, money, marbles or chalk, that will keep them from making the climb. That's religion enough for me. Enough for the Kyle Murrians too, evidently, because they've always honored any contracts we made for climb parties. I'm reasonably sure that they'll honor this one that we've made for your party. I don't think J'Gween would have stayed inside the Lodge if the Kyle Murrians didn't intend to let you climb.

"In any case, he is here and he's willing to make a start. If you can get FitzRoi before the rest of the Kyle Murrians get here then this riot may smooth out. If not...well...I can't really promise to protect any outworlder in this Lodge any more, regretfully.

"I don't seem to have too many alternatives to offer you, Lady Van Horn."

"Arden? Doc?" Jessica asked for support.

"We can climb," Arden said. "But what do we do if we catch him? Nobody's said anything about that."

"Alright, Jessica," Doc said. "If you want to make the climb, we'll do it." He was remembering the Marine Colonel, so long ago back at *Muggy Three* telling that part of his job would be to protect Jessica Van Horn when she climbed the Tree. This job seemed

There's a hell of a good **universe**
next door; let's go.
e.e. cummings

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to be exceeding his brief a whole damned lot.

"Me? I don't..." Jessica started to say. Then she realized that she did want to make the climb, regardless of the reason. There wasn't any real sense of danger in the mob outside. It didn't compare with a delay in the TSC's planning for the climb of the Tree. If General Bryant wanted to turn the climb into a chase after FitzRoi, well that was his business. At least they would be starting the climb. "Leighton said that three could make the climb," she finished evenly, making her decision. She would climb.

"Leighton. Right!" Bryant snapped his fingers. "Hendricks? Did Leighton ever call in? Is the ground line still connected to the Tree?"

"Yes to both, General," the comm-operator reported. "He's ready for the climbers whenever you want to send them out. He's got a report for your ears only when you can take it."

"Get to it in a moment. Ah, here's Smithers back. What have we got man?" The two men he'd sent out to his office had come back in carrying a thin wooden box. They laid it across two chairs and Bryant opened it. The box held four thick-barrelled rifles and a group of six pistols were clipped to the lid.

"Here you are, Barth." The General took out one of the pistols and loaded a clip. "Narcotic darts. Our very best hunting equipment. That answer your question about what you do when you find FitzRoi, Doctor Barr?" He passed another pistol across the table. "Here is yours, Doctor. And extra clips. Lady Van Horn, do you want to go hunting? I know you can shoot, it's on your records."

"I'll pass. Narcotic darts? If we're climbing a vertical pitch...if FitzRoi's climbing and Arden knocks him out with one of those..." Jessica didn't finish, she didn't really have to, instead she asked quietly; "*Do* you expect us to bring him back alive, General?"

"Flier's ready, General," somebody called. "We can still get out to the dock. Your party ready, sir?"

"Are you ready, people?" Bryant asked solemnly.

Doc answered for the three of them by picking up his pack and sliding his chair back as he stood up. The others stood up with him.

"No, Lady Van Horn," the General went on to answer Jessica's question. He had taken their acceptance of the climb assignment as a matter of course. "I don't care if FitzRoi comes back alive or not. When I gave you those hand guns I expected you would have to use them to kill. That's what guns are for, Lady, even when they have narco-loads. I expect that if, and when, anybody shoots FitzRoi he will fall. And on the Tree, unless he is clipped on with a safety harness, when he falls he won't stop until he hits the ground.

"But you are still going to climb, aren't you?"

"Of course they are going to climb!" A strange voice echoed the

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General's words. "They told me at the spaceport the contracts had been said. There isn't time to resay them."

Doc Barr had been facing the door leading to the rear flier deck and he'd seen the five Outstar Marines come in. The others were surprised when they turned to see the Mountain Marines shedding the release straps of their jet-jump gear. The Marine landing boat had dropped off a squad party as it passed over the Lodge on its way to the spaceport.

"Dorothy Estaban," Jessica said, recognizing the officer.

"Colonel Estaban reporting for duty, General." Dorothy Estaban was correctly at attention. She didn't salute, Mountain Marines didn't use the salute on combat missions and Colonel Estaban was carrying a rapid-fire rifle. "My company will deploy at the spaceport and join up with you here if they are needed. I came in ahead to contact you and get your briefing on the FtizRoi situation."

"Good. You can take over and climb up after FitzRoi instead of us," Arden said.

"No. She can't do that. Mr. Barth," General Bryant said. "I don't have a contract with the Kyle Murrians to let military personnel climb on the Tree. And it would take too long to get one. If we could under the circumstances.

"Glad to have you aboard, Colonel. The Kyle Murrians haven't done anything but crowd around out there..." he gestured, "and drum. You know about the migration from the spaceport?"

"Yes. I got the word before we jumped. It's being tracked."

"Very well. Dispose your squad as you see fit. Do not fire on the natives until you are overrun. Oh hell. You know how to handle a riot. This isn't a riot yet and I don't think it will break out until FitzRoi detonates his bombs."

"Then your climb party had better start, sir." Colonel Estaban said. "You are going to send them after FitzRoi?"

"That is the plan." Doc said. "If you're not going. we'd better get moving. FitzRoi's climbing and I rather think he climbs fast."

"Oh, hell, let's go," Arden said. "We'll think of some way to stop him. Jessica?"

"Yes. I say we climb!"

J'Gween began stoking his drumsticks, the cadences talking to the drums outside the Lodge.

They climb. They climb. They climb. They climb.

9

Doc got out of the Club flier, helped Jessica out, then waited for Arden. They moved absently, helping each other with the climb packs by touch more than sight. All three of them were looking steadily at the group of men and Kyle Murrians over by the base of the Tree...and at the sprawled body on top of the pile of climb equipment.

"Who was he, Mr. Leighton?" Arden asked when they got close enough. "Accident?" The only

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reason he could think of for the body was that Leighton had tried to mount a climb and somebody had fallen. The first job he and Doc have to do would be to help get the rest of the party down off the Tree. Arden was a professional tour leader and had worked on such rescues before. It happened, when one member of a party fell, the others became frozen, unable to move up or down until someone could get to them and break through the shock.

"His name's Anderson," Leighton said. "Captain FitzRoi's corporal. We found him here this morning when we came out to set up for your climb." Leighton's voice was crisp and concise, he'd put off his fussy secretary manner for a sterner efficiency of movement and speech. All of General Bryant's staff seemed to be a lot tougher suddenly, now that things had gone sticky. "It seems that FitzRoi has gone climbing on his own after all. The General brief you?"

"Yes," Doc answered for all of them.

"Well, climbing's not all he did this morning. These two," Leighton pointed at the two Kyle Murrians, "These two brought J'Gween the news about the dead guards at the Grove—and the explosive. J'Gween told me. I had A'lween and the other two take me out to the Grove this morning, early before the drums started everybody moving. I got a look at the bomb. It's a TBA package and really booby-trapped, people. The charges can't be pulled off the tree without setting them off. Very tricky!

"By that time the Lodge was blocked off by the Forest People, so A'Lween brought me out here. We found that FitzRoi had been here ahead of us. He'd raided our climb-gear and gone on up the Tree. He left Anderson behind."

"Alone!" Jessica looked up the escarped tree-side. It was a vast bark wall, towering out of vision range into the morning mists above her. The idea of one man challenging that massive living cliff was unbelievable when she stood this close to it.

"A solo climb, just like he's been saying," Doc echoed her feeling. "Can he do it?"

"We don't think so. It means two days steady climbing without any help, for one thing; there are other reasons. The Kyle Murrians...."

"Anderson?" Arden cut in. "Was he murdered? Or did the Kyle Murrians...?"

"Murder," Leighton said. "Some kind of a dart. The same kind FitzRoi used on the Guardians—fatal. I told the General about it and he passed the word on to the Marines. They will tell Sergeant Burton. He runs the Native Police Force, you know. I understand they'll be here sometime—Sergeant Burton, I mean. The Marines are already here.

"And so are *they*. Here *they* come." He was referring to a group of Kyle Murrians pacing slowly toward them up the cleared grass-ground of the view lane. "I could do without them, I sure could."

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"*They*?" Arden asked.

"Mr. Leighton!" Jessica had a sudden recall of the way FitzRoi had constantly bullied the natives. "Are they the ones that are going to go after FitzRoi? You aren't going to let the... Kyle Murrians hunt him down. Isn't there some way you can stop them?"

"No. That won't happen. They've got every right, but that won't happen." Leighton answered Jessica's concern. "The Kyle Murrians know enough about the machines and science that we've brought in here to recognize how much danger there is to their Sacred Tree from the explosives. They know explosives from the time when we built the Lodge. No, they won't move against FitzRoi while he's got that tree mined. J'Gween has briefed me on the taboo. But he didn't say something about sending for the Drum-talkers."

"Of course, Drum-talkers," Doc said. "DeSpain had a whole chapter about them." He was peering closely at the approaching Kyle Murrians. "See those three wooden rods that they're carrying on their left shoulders," he said to Jessica. "They are carved with waves and bumps and hollowed out with precisely tuned slots. The talking stick, the short one, is rubbed or pounded against the other two. At the same time air is forced up the hollow center from that bellows under the armpit. The result is a portable drum. The Drum-talkers use them for major ceremonies."

"And messages," Leighton said. "Beside the big drum branches at the Lodge, those talking sticks have already passed the word of what FitzRoi did. The spaceport, the fisher villages up the coast, all the forest villages; they all have sent the word half-way around the planet by morning—wherever there's anyone to hear. The Native Police at Sergeant Burton's station will hear the drum-talk about the time my radio call gets delivered. It's like being in a spotlight, everything we do here will get drum-talked across half the continent. I could do without them if I had my choice."

"Can't you talk them out of doing it," Arden said. "They'll warn FitzRoi that we're coming. Maybe get him excited enough to blow up something."

"No chance. The Drum-talkers don't talk, except with the drums. J'Gween can tell me what they say and drum back; see he has his own stick. I'm not going to be able to stop them from drumming though. No chance. They know that you are going to climb and that's about all I can have J'Gween tell them. Come on, we'll go get that much transmitted."

"You go drum at them," Arden said. "We came out here to climb. Hadn't we better get started on that? Or have you changed plans again?"

"Maybe he's going to wait around for the police," Jessica said, feeling a little hysterical in her nervousness at the prospect of the climb. "Now that the Marines are here maybe we can wait. After all he has got FitzRoi up a tree." She giggled unreasonably.

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"Marines? No, the Drum-talkers wouldn't let them climb not with the explosives on the Sacred Tree. If FitzRoi saw Marines he would blow the Grove Tree. I'm sorry, people," Leighton said. "But I do have to send you up after him. You're the only climbers I've got in the Lodge. J'Gween and A'Lween will honor the contract and guide you, but you'll have to do the work.

"Look, the Lodge will make it worth your while, of course. All expenses, up to now, refunded and later, if you still want to, a more leisurely, entertainding climb—also on the Sporting Club."

"Oh fine. Money back guarantee if we don't get shot at," Arden snapped, angry at his own feelings, at the sudden leap of desire. He was the only one of the three broke enough to make the monetary refund irresistable. He hated himself for the greed that reinforced his decision to make the climb. "We bought the General's sales pitch, Leighton. Don't over do. Just get on with the job. Let's get climbing. What about the rest of our equipment?"

"Right. And which way do we start off," Jessica said. "How far ahead is FitzRoi? Or should I say, how far above?"

"We'll need food," Doc said. "What do you have organized in the way of rations? And maps?"

"Right. Wouldn't want to get lost. Come on, Leighton. We came here to climb the Tree didn't we," Jessica added. "Let's get busy."

"Leighton, just a minute," Doc had one final thought not concerned with their climbing. "What about the Police? Can't they, or the Marines, do better with a flier than we can? It should be faster locating FitzRoi by air, than climbing after him from below."

"No good," Leighton said and held up two fingers. "One: the branches and the air circulation—wind. They can't fly close enough. Two: Kyle Murrian taboo is against aircraft near or over the Tree. It's definitely restricted airspace. You saw the way your flier landed way out and came the rest of the way in on ground-effect.

"But Sergeant Burton will be here tomorrow, sometime. Either he or the Marines will start up the Tree behind you, then. His Kyle Murrian trackers are exempt from the taboo when they are on duty. One of them can guide the Marines up to you. They'll be one day below you, but they'll find you."

"Fair enough. Maps?" Doc went back to insisting on the equipment they would need.

"Everything you'll need is right here in this pile. J'Gween will guide you so maps won't be necessary. A Tree contract is a big piece of religion with these Forest People. He won't break it...that is, he won't help with FitzRoi, but he will guide you. And he's the best guide there is."

"Alright. Fair enough. Next thing is food and water and ropes." Arden swung into a well-remembered routine. He'd taken parties up mountains before, it was his job, the habit of put-

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ting a hundred-and-one details together in proper order came naturally to him. It would have been impossible for him to sit idly by and watch.

Doc, and then Jessica, followed his lead easily, because Arden seemed to be doing just exactly what they wanted to do, but a few seconds faster than they did it. Besides, the situation didn't seem to call for a great squabble over the power structure of their three-man climb team. With one accord, they grinned at each other, Jessica clicked her boot heels together, Doc saluted, and Arden was elected climb-leader.

The preparations spent another hour of the morning, but neither Arden or J'Gween shorted any essential equipment. Ropes were measured, on J'Gween's advice of required lengths; climb harnesses were fitted; and ration packets distributed. Doc had split up the extra rations and water that Leighton flew up from the Lodge to replace those pilfered by FitzRoi. Jessica set herself to divide up the climb-loops and caribiner clips, and to make up the carry loops. Their work was fast and accurate, jobs they all had done many times before, even though they had never worked together.

When Leighton's flier had made its second trip up from the Lodge that fact indicated that the General was still holding his command post and that the Kyle Murrians, for all their mobbing-about, didn't intend any mass violence. Arden, Doc and Jessica seemed to relax a great deal when they realized that the native riot wasn't going to happen right away. They were soon roped together and ready to climb.

There was no ceremony, no one said goodbye. They had been working to the beat of the drums. Their work became smoother as the all-persuasive drum-sticks of the Kyle Murrians tied their working motions together into an easy teamwork. They finished the last task on a rising drumbeat and simply began the climb in a measured rhythm with the Kyle Murrian cadence. J'Gween stroked his own drum-sticks to match the Drum-talkers' beat and led off. He moved along one of the two-meter high root burls and around a fold of bark to lead the party toward one of the training climbs up the base of the *Kyle Murre* Tree. Arden followed him. Jessica, letting the climb rope stretch out to half its length, followed Barth and Doc came close behind. The second guide, A'Lween brought up the rear.

Somewhere on the towering vertical wall of Tree bark, FitzRoi was climbing ahead of them. Forty-two-hundred meters above them, invisible in the clouds, the record summit stood as a high, lonely goal.

The Kyle Murrian drums set the rhythm. Arden, Jessica and Doc climbed.

10

J'Gween stopped at a point where he could look back and down at the three Off-worlders in his climb party. They had responded to the Emergency

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call, and their honor had caused them all to make the climb; to try to stop Ca'tn FitzRoi. J'Gween was not concerned that they would not follow him, stopping was merely part of his Tree-skill with any new group of climbers. He wanted to watch them climb for a few moments in the beginning, before the work got difficult.

The morning climb was going well. The beginning pitches were steep and they went in and out of the deep furrows that made up the Tree's base structure at this level. The furrows were seventy-five to one hundred-fifty meters deep so that sometimes the party was climbing with each member out of sight and sometimes they were working on both sides of a cleft—going in and coming out. J'Gween's position was far enough ahead of their climb-route that he could watch them as they came up the Tree toward him. The ascent here was easy, wide ledges and firm holds, and the party was moving with a good speed. They were following a bright-colored guide-rope, strung through fixed climb-loops by the TSC Lodge, both as a safety line and to mark the pitches. J'Gween wasn't needed as a guide here because of the marker ropes. He was climbing free so he could move around the party and assess their climbing ability. Here on the Tree they were his responsibility, their life and death were part of his prayer-drumming. He was beginning to think of the climbers by their names, now. He would still speak to them formally, but in his mind he thought of them as he did cubs-on-the-Tree, to make use of the magic of their familiar names, so that his prayer-drumming and skill would have more meaning, more power, in harmony with the Tree.

Tsa *Arden* Barth was climbing in the lead, or rather he was setting anchors to let Mentsa *Jessica* Van Horn climb up to him. He'd taken the lead position without asking, even though it was J'Gween's traditional right to position climbers on the rope. He'd been leading the other two Off-worlders right from the beginning when the Lodge staff air-lifted the party out to the base of the Tree. He'd supervised the repacking of the food loads, even though they were all prepacked and labeled for each climber and this job was one of the duties of the second guide *Aij* A'Lween. The Mentsa

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Jessica had done some of A'lween's work too, helping with the climb-loops. She had left the number and sizing of the loops to A'Lween's skilled experience, but helped him string them on the carry ropes. The carry ropes were scaled to the size and ability of each climber so that no one would be overburdened by the weight and bulk of the climbing clips. The cooperation between the two, Mentsa Jessica and A'lween, had been very good. When they had finished with the carry ropes, Mentsa Jessica's rope had bulked only a little smaller than that of Tsa *Doc* Barr, despite the fact that the weight of the loops seemed to make the old one stoop even more.

Mentsa Jessica was climbing well. J'Gween watched her come up to a stance beside Tsa Arden and saw her check the loops of his belay anchors before she clipped into them, tugging her rope hard after she locked the caribiner clip. A careful habit that. J'Gween nodded to himself, as the woman got ready to let Tsa Arden climb ahead. The Mentsa was climbing in the number two position on the rope, with Tsa Arden ahead of her and Tsa Doc behind for further protection. J'Gween didn't mean this to declare her third rate in any company, or as a slight because she was female. The memory sticks rated her climb skill higher than that.

"*Tsha ckk*," He remembered apologizing to her as he gave her the safety harness for her belay anchor slings. "The Mentsa Van Horn cannot climb below the leader without these," he had told her. "She is too light, may the insult be forgiven. It is the needful-way-on-the-Tree. Should the leader fall, the rope would pull the Mentsa off too. You must have a firm, two-point anchor below the leader to hold a safe belay."

Tsa Jessica had nodded her understanding to him and shown no anger or refusal to use the harness. She accepted his Tree-lore and wore the straps. No doubt she had been able to handle falls before and trained herself to develop a strong belay method for her weight and strength. She would not have such a good climb record without such skilled climb-lore. But her safety on the Tree-climb was part of J'Gween's job and instructing her as he did, was his way of curing a weakness. There was no weakness in her climbing, so far. She balanced well, climbed with her legs, not her arms, and managed her ropes with authority and knowledge.

"Tension!" Mentsa Jessica called. Her clear voice echoing in the canyon like fold as he took up Tsa Doc's rope to let him climb up to her.

"Climbing!" Tsa Doc hadn't moved until she was ready.

J'Gween was well satisfied with the way his party climbed. They would climb in-the-way-of-the Tree. He changed his stance and moved on up the guide rope, climbing ahead of Tsa Arden so as to be out of his way.

The trio climbed around the outer bulge of the projecting nose and changed direction to work back up

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and over the declivity they had just left. They were climbing away from the sun now. Jessica found that she was balancing more on her right leg and foot when she made traverses, reaching for holds with her left hand and left foot. The switchback in the guide-rope had come as a surprise to her when she'd reached the belay point—a permanent set of anchor nuts and ring nuts—and found Arden's rope angling above and behind her. She'd dutifully followed his, "Up this way. We zig back for a while now." She turned back even though she could see a good line of holds leading up, then across, to another easy upward pitch.

She shrugged her pack into a more comfortable balance and followed the rope. There was a long way to go and, in any case, she was climbing on Arden's rope, committed to follow his lead. Arden would have seen those easy holds too, and checked them out. Perhaps they went no further than she could see. The Tree was big enough to have more than one way to the top.

Even though he was now headed back toward the point where they'd started, Arden had been climbing steadily. The guide rope followed traverses that were almost all upward stances, good, solid climbs, and Jessica was well above the tree tops of the forest around the great Tree. Climbing in this direction, she could catch an occasional glimpse of them below, as she waited for Doc to climb up to where he could belay her next climb or when she braced herself to guard Barth's rope and had time to look out, away from the tree-bark, at the scenery below.

Barth was leaving her plenty of time to take in the view. He was leaving anchor-nuts behind at these belay points, knowing that Jessica would need a safety line on any belay she tried to hold. For a while, she was angry at finding these loops in place, thinking he was patronizing her, being overly helpful of a female. This early on a climb, such waste of strength and division of attention was dangerous. Barth should be concentrating on his own safety more than on hers. Then she calmed down, her anger was wasting her strength in unwanted tensions, and realized that Arden was only helping her, without any extra effort on his part. Because of the formation of the bark ridges and the nature of the holds and foot rests, there was no real bomb-proof way to hold a belay without a safety line and anchor loops. Arden, Jessica and Doc were climbing a vertical wall, not a rock mountain; real high-angle work. All Jessica's belay points, so far, had been standing ones. Barth, even though he was climbing ahead of the group, had to use nuts, clips, and safety lines when he set his belays—to protect Jessica as she climbed up to him. He had no other alternatives. In some places the Lodge staff had left permanent anchors, so Barth was just following their example when he left his set-ups in place for Jessica to use. She, in turn, left them for Doc Barr, who, as the last man on the rope, would pull

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them out and clean up the Tree before he climbed. This procedure settled down to a comfortable routine and the group climbed steadily.

A scuttling, scrabbling noise rasped at the bark near Jessica's left hand, causing her to jerk it back. She was pressuring against her left leg and right hand, well balanced, so that she didn't fall or slip, but her instincts relieved themselves of an involuntary reaction to things that crawl and scrabble. She screamed.

Doc Barr reacted to the scream. To him it meant only one thing. He snatched in the slack of Jessica's line, flipping it over a protruding spur of the bark above him. He did this without thinking or reasoning, a product of his years on the rocks. He expected Jessica to fall.

His reasoning took over when he realized that the rope was running taut up to her position. He hadn't taken in any slack and the rope wasn't pulling through his fingers. In fact, the rope was sending back its subtle messages, telling him that the woman was still balanced normally, not twitching the rope in strain or hurry. She hadn't fallen, or even missed a hold. Then why the scream?

There was a rustle above him and an insectlike animal came scrabbling down the tree. It was pale-bark colored and moved jerkily, peering with two blind-appearing eyes. It gripped the tree with pincer claws and made a lot of noise as it moved.

Doc relaxed, grinning slightly. The scream was easily explained. But somebody should have told Jessica to expect to find living things on a living Tree.

"Mentsa Van Horn is in trouble?" J'Gween called out. "This one heard the fear sound." He was coming down the Tree directly above Jessica's position. Barr could see him. The guide was climbing free. He slapped a nut-loop into a crack above Jessica's head, tugged it, and clipped a line to it, then stepped down to her stance position and clipped the line into her climb harness without asking permission. It was a smooth, timed performance, the guide moving on foot and hand holds so small that Barr hadn't noticed them until he used them. When J'Gween finished, Jessica had an extra safety line and he continued talking as if nothing had happened. "I have secured your anchor, Mentsa," the guide said. "Relax lightly and breath slowly. It is needful-on-the-Tree."

"I'm all right. Some kind of animal ...insect." Jessica said, somewhat loudly. "It jumped at me. Or I scared it. I don't know which."

"Lady Van Horn? Jessica? Are you set on the safety line? Doc called out.

"I'm fine, Doc I'm clipped in bomb-proof. You can climb on up."

"Just take up the rope," Doc called. "Don't worry. This is an easy pitch."

"I'm really alright, Doc." Jessica's voice at least was bright and cheerful. "As long as J'Gween can keep things from jumping out at me."

"What you saw was a *padtsha,* Mentsa. They are timid beings and

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need not be feared. Nothing we will meet this low on the Tree carries fang or poison." Then he called to Barr below. "You may climb, Tsa Barr. The Mentsa controls you."

"How are things down there?" Barth called down from his lead position. "You alright, Jessica?"

"Climbing," Jessica called back. "Doc's coming up now." She felt him begin his climb by the tensions on the rope and set herself to give him proper belay, taking up on his rope, working it across her shoulders as it became slack.

J'Gween unhooked his own safety line and stepped up to find higher hand and foot holds and so get out of Barr's way. He anchored himself to a climb-loop and balanced on this higher hold, waiting for the two climbers to go on with their routine. He stared up the tree, looking off toward the shadow side in the direction from which the *padtsha* had been scrabbling. The little animal was lower down on the Tree than usual. Was it still running away from the climbing of Ca'tn FitzRoi above and ahead of them...or had it been frightened by something closer? The Ca'tn was armed: had killed. J'Gween probed up the Tree with all his powers, trying to sense some break in the pattern of the forest giant, some changes in its natural force that would indicate that the Ca'tn was near... perhaps hiding to kill again....

"*No, the climbing-thrill will be on him by now*," J'Gween decided silently. "*He is moving up through the vertical rilles by now and will not climb back downward. We will be at the Cave of Winds soon. Behind him, but we go by an easier climb. He will be slower as he goes higher. A solo climb is not an easy thing on the Tree.*" Still, there was threat. If FitzRoi knew they were close to him he still had the threat of the explosive trigger—the danger to the Grove Tree was a threat. J'Gween decided to keep his climb-party as far from the Ca'tn as it was possible to lead them.

Doc Barr climbed up beside Jessica and clipped his harness line into the nut-loop. He flicked a quick glance at her safety line, adequately knotted, properly clipped, and said nothing about her equipment or the scream. He was reasonably sure that she was over sensitive about being a female who climbed in a man's sport. *Perhaps she had a right to be,* Doc thought, *We certainly over reacted to her scream.* If a man had been startled by that bug, he would have yelled and the climb would have gone on. Nothing more. Nothing said about his shattered nerves or momentary fear. But Jessica's female scream brought males from around to protect her. *Defense of the female while climbing the rocks of the cave,* Doc Barr's thought ran. No doubt a very, very old instinct in man—deeper than civilization, certainly. I wonder how far back we are taking those cave-man instincts when we started to climb this tree. Caveman back to proto-ape? He chuckled to himself at the thought as he coiled his rope and found a stance position from

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which he could belay Jessica's next climb.

"*Tij* J'Gween," Jessica called up to the guide. "Thank you for your concern. I am really all right now. I was surprised, I won't be again."

"I can see that, Mentsa. May I suggest that you climb always with your hands low; lower than your shoulders, always. On the Tree, this is more comfortable—and safer."

"I hear your wisdom, *Tij*," Jessica said. She'd also picked up the formality of address.

"Ready whenever you are, Jessica," Doc said.

"Barth?" she called out. She was ready now, indicated it by facing the tree-surface and reaching out toward the first handhold.

"Set," came the call from above.

"Climbing!" She started up the pitch, following the line of the guide rope and the team rope. She was climbing strongly with no hesitation, the holds were plentiful and obvious. However, she was keeping her hands noticeably lower, not reaching so far for her handholds. She was, in fact, following J'Gween's advice and it made her climbing easier, smoother, certainly less tiring.

J'Gween watched her climb a few minutes, then said softly; "The Tree helps her climb. She does not combat its ways." Doc Barr nodded, resolving to use that technique himself.

"I will go on now," the guide said. "We must hurry a little. The Ca'tn FitzRoi is ahead of us. His plan of climbing alone means that he must climb upward faster than we do, but he will climb slower—unless he is a climber of great skill. I do not believe he will climb with great skill. With him, the climbing must be always a combat. I believe he will climb with great strength, but the Tree is not afraid of strength. It can suck strength from a man like it sucks moisture from the air.

"Always on the Tree it is better to climb so that the Tree helps your climb."

"I hear your wisdom, *Tij*," Doc Barr said formally.

The guide didn't reply to this, only twisted around and began his climb back up the ridge, moving quickly out of sight.

Doc let Jessica's rope pay out until it tightened, then held still. He got her "Tension," call, answered "Climbing," and went on up the pitch. Since he was the last man on the rope he brought up the nut-loops and caribiner clips, adding them to the store-rope across his chest as he pulled them out of the tree-bark.

They climbed like that for another hour, easy ascents and climbing traverses of no special difficulty. During the last half-hour the general trend of the climb made another switchback and they were once more climbing toward the sun. Also, toward the end of this hour, Doc began to hear calls and angry yells from ahead—Barth and J'Gween—although he couldn't make out words.

Finally he worked his way around a large protruding ridge and found the

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whole party sitting on a wide ledge in a deep folded convolution of the bark. J'Gween and Barth were in the back of the fold, facing each other. They were still arguing. Jessica Van Horn was sitting off to one side, still handling the rope as Doc came in along a crevice that had a two step-up climb at the end.

"What's the fight about?" he asked. The ledge was wide enough to sit on securely—it was really a small, shallow cave, but it had a safety rope installed along its back wall and there was a steady wind blowing in toward the back of the cave. While the wind wasn't strong, Doc supposed that the safety line was there for times when gusts blew with more power so he hooked his anchor line to it with habitual safety caution.

"J'Gween thinks Arden is climbing too fast, without any regard for the two of us below him," Jessica said, grinning. "And Arden says he doesn't want to spend all day on the school pitches. They've been saying the same thing in different ways since I came up."

"Were they waiting for me?"

"Only partly, Tsa Barr," The guide came smoothly beside Doc. "If you will give me the clips and loops you recovered I will redistribute them to Tsa Barth and the Mentsa. In this we waited for you, Tsa. In all else, we wait only long enough for a short rest. Here. . ." he gestured at the alcove, "in the Cave of Winds is a place where you may sit for a moment. There are not many places on the Tree where Off-worlders may find this comfort. Rest, Tsa Barr."

"Relax, Doc," Jessica said. "It won't last long. Arden will have us up on our feet in short order. He didn't want to stop in the first place. J'Gween made him."

"It was needful-on-the-Tree," J'Gween said. "The party had to come together, Mentsa. Beyond here we leave the marked trails and must climb close together so that each climber can mark the route."

"Then the climbing is more difficult beyond here?" Jessica asked.

"It should not be beyond your abilities, Mentsa," the guide said. "I was told of your skill when I accepted this party. Did you truly find that which you just climbed troublesome?"

"No." Jessica shook her head. The climb had been easy. Her muscles were stretched and her rope handling skills had become second nature, coupled to her movements. "The climbing is very much like moving on granite. I forgot that I was on a Tree. . . until that animal jumped at me."

"I expect that's what the 'school pitches' are designed to make it feel like. Just another rock climb," Doc observed.

"I have never climbed on rock, of course," J'Gween said, "but you are right, Tsa Barr, or so the Taansvaal Sporting Club says, those who planned the stances on the lower trails. We will climb vertically a little faster from here on. It will be more interesting."

"An impossible climb that someone

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else just climbed," Barr and Jessica both said, in echoing unison, repeating the old, old joke definition of an "interesting climb." Then they laughed together.

The echo of Jessica's laugh broke Arden out of his sullen sulk at least. He lifted his head, suddenly attracted by something on the Tree-side. J'Gween also turned his head, having heard the sounds. It was the second guide, A 'Lween, coming into the cleft from an unexpected direction. He moved along above the ledge, climbing directly to join his chief, spoke briefly in low tones and then took a double handful of the climb loops from J'Gween and began to distribute them in routine fashion.

"Tsarias!" J'Gween said loudly, attracting attention before anyone could read the sense of failure in the motions of A 'Lween's tail, the set of his ears. "There has been a lightning strike on the East-way. *Ai j* A'Lween brings word that it is no longer possible to climb that way. Instead we must go out by way of the tube behind you. The packs must be pulled up by rope."

His announcement pulled everybody to their feet to cluster at the foot of J'Gween's tube—a closed channel in the tree bark. It had perhaps started as a narrow groove, but the lips of the bark had grown together leaving and irregular tunnel, one and a half to two meters wide. It was a vertical rise of seventy meters, the longest straight up climb they'd attempted so far. The small opening at the top of the tube glowed in the cloud-light far above and the wind was blowing stiffly up the bore, tugging at their climb clothes and forcing their eyes half closed with it's pressure.

"We will leave as soon as you have rested," J'Gween finished.

"I though we were supposed to be chasing FitzRoi," Arden said roughly. "How do you expect to catch him, sitting here? Or do you? He won't blow up your sacred Tree as long as you leave him alone...is that why we're still on the school climbs?" He unbuckled his pack and dropped it to the floor of the cleft. "At least this is one climb that goes up instead of back and forth." He went over and looked up the bore. "Doesn't look so bad. Not worth waiting too long for. Hummph, Doc, come look. They have harder climbs than this in the mountaineering school at Tell Alph." He put his back in the chimmney and braced his feet against the opposite side. "In fact, this feels like Chimmney Five there. Remember the wind in that bore, Doc? They let children climb that one." He pushed off with his hands and started working his way up the bore.

Jessica threw the coils of rope off her shoulder and moved up under him to feed the climb-line to him.

"Hey, what about the rest period?" she said, tilting her head to let her hair blow up away from her face. "Doc hasn't gotten much rest at all."

"What are you going to do about it," Doc said dryly. "Pull him down? Go on! I'm all right. This is a light

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planet." He took off his pack and placed it by Barth's, then reached out for the girl's rucksack and harness.

Jessica shrugged out of her equipment, positioned herself and, when the rope ran out of slack, started to climb.

J'Gween tied all the packs in a strung-out bundle and left them for A'Lween to manage. He went out of the cleft along the outside of a ridge that the Off-worlders couldn't climb and headed for the top of the tube. He had to be in position to keep Tsa Barth from climbing on without the packs, so he hurried.

"Set a check there!" Jessica called out. "Your rope's getting too long."

"Better place just around the corner," Barth said and edged sideways around the fold of bark. Jessica fingered the rope nervously and looked at her anchor-loops. She had fastened herself to this particular belay stance with two stopper-loops, one below her to the right and the other, a large hex-tube, in a good strong slot behind and above her right shoulder. She gave this one a tug, to seat it more firmly, then brought her hand quickly back to a tension position on the belay rope curved around her shoulder. Barth was still climbing too far ahead, making long traverses and getting great amounts of rope out before he stopped to let Jessica and Doc climb up to him. He had been climbing like this ever since they left the vertical bore tube. He continually ignored any attempt to get him to plant stopper-loops and caribiner clips to shorten his rope and give himself some measure of safety. If he got a loop fixed where Jessica wanted him to, or even just beyond the fold in the bark, he would take half the climbload off her belay rope. Right now he had over eighteen meters of rope out and was considerably higher than the girl's stance. If he fell he would drop nearly the whole length of that rope before she could begin to stop him. His body weight—the distance of a fall—both added up to velocity and energy that would strain the rope to its safety margins. The rope was good for loads up to eighteen hundred kilograms and the loops of his anchor chocks, over twenty-three hundred. They would take far more than any holding strength than Jessica could provide. She was the weak link in his safety and she knew it. One safety stopper in Arden's line would cut the length of fall, reduce the forces drastically, and give her a chance of holding him. But Barth kept climbing further and further away from his belay point.

The rope went dead in Jessica's hand; lifeless, no tension or twitches, no slack—a nothing, a piece of perlon.

Arden had fallen!

11

Because she had been half expecting it, Jessica knew in milliseconds what had happened. Her hands were frantically pulling at the rope; her right, hauling in the slack along her shoulders, her left hand still extended, slinging along the rope. She threw

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herself flat against the surface of the Tree, bracing her outstretched leg with all her strength against the pull she knew was coming and flattening herself against the bark to add the force of friction to her body weight and the strength of the anchor. Her reactions were so quick that she was in position even as she heard Arden's high, astonished yell.

The pull spun her tighter against the Tree face. The rope burned out through her hand, pinned her body to the bark, and tugged forward against the bracing of her outstretched leg. She let the rope run, snubbing it in brief spasms with her gloved right hand, so that the whole length, pinned under her and wrapped around her back in the belay loop helped with the braking. She didn't stop the rope entirely, fought her instincts to grab on and hold the falling man. Too sharp a strain on the rope would stretch it beyond its breaking point. Slowly, the seconds stretching timelessly, she braked the rope until she had it stopped. And it stopped. Stopped with a weight on the rope, pressing her down against the scraping, bruising tree bark in a way that brought a leaping, joyous cry to her lips.

Arden was still hanging from the end of the rope—somewhere, safe. The rope hadn't broken!

The rope stretched out in front of her, across the Tree-face, still rising up and over the nose of bark. It hadn't slipped sideways and down, still went up to a point higher than Jessica's stance position.

Wonderful! Arden *had* planted a stopper-nut and clip before he'd fallen. Jessica was holding him from her belay through a higher safety-clip point. A real bomb-proof nut too, evidently, for it was holding most of Arden's weight. The fall wasn't such a bad one after all.

No, not bad at all. Jessica gathered her strength. She had to move while the adrenalin was still boosting her strength, before the crushing weight of the rope squeeze collapsed her chest and cut her breathing....

She rolled slowly away from the Tree, using the leverage of the rope around her back and the push of her leg to pull the rope with her. She didn't gain much, but finished upright with both legs braced against the rope's pull and with the belay loop firmly across her back. She was facing in the direction of the rope now, with the strain of anchoring Barth divided equally on the anchor ropes and her out-thrust legs. She could hold this belay for a long time. Long enough for J'Gween and Doc to climb up to help.

Doc would have heard the yell, realized its meaning and now be climbing solo, ignoring her support; climbing up to help. J'Gween, up ahead of Barth would be climbing down. Either they would get here and give aid in pulling Arden back up to where he could get a hold, or Barth would find a hold and supports down where he was, and start to climb again. The position was static, strainful now, but static. It wouldn't last

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long. She could hold the belay until help came.

In fact, amazingly, she could see Barth. Arden had dropped clear of the nose projection and was hanging in plain sight. He was conscious and active, busily tying an entrier loop onto the rope above his head. He was cooly making preparations to climb back up the rope to where he could find a hold. As Jessica watched, he hooked a leg in the loop he'd formed and shoved a second loop higher up the rope, tugging the knot to lock it onto the tight-stretched climb-line.

There was a flash of yellow cloth and the guide came into Jessica's view. He was climbing free, down the face of the Tree, parallel to Arden's rope. His clawed hands and feet finding holds and rests that only he could use. He appeared to be walking down the sheer face of the Tree bark.

When he reached the level of the hanging climber, the guide put in two hex-bolt loops and rigged a body anchor for himself. This was the first time on the climb that Jessica had seen the guide use more than a single small supporting loop.

Testing the anchors with a quick tug on each, J'Gween planted his feet and hands close together and arched his back out, away from the Tree. He would have looked like a spitting cat if he had been standing on level ground. Indeed, like a cat, his long tail came straight out from his body and reached out for Barth's dangling leg. Its flexible end curled around his boot and contracted to pull him toward the surface of the Tree.

J'Gween held his grip, held his holds on the Tree, his climb-claws gripping the Tree-bark. His tail strained against Arden's dangling leg and forced the foot down towards the ledge-chip, held it there until Barth felt the foothold beneath his boot. The man's muscles tightened, changed their drive, as he sought his balance. His other boot scrabbled a few times, then found purchase. The guide felt him reach out for a grip with his hands, fingers seeking and finding supporting holds. As he dug his fingers into the hold points, his body arched back against J'Gween's arm with a different tension of muscles. Arden was bracing himself away from the Tree in an attempt to balance his weight on the footholds—climb-skill.

J'Gween pulled his arm away, released his tail-hold and took another climb-loop from his holding clip. He placed it in a crack above Barth's head, setting it and testing it with a quick jerk and pull. He unslung the short safety line he carried and hurriedly, so that the climber might not be tempted to help him, anchored Barth's safety harness to the loop. He made these moves with quick, practiced speed and had the man protected by the double safety line while Arden was still adjusting his balance to the Tree's surface instead of the rope.

"The Tsa Barth was climbing too fast," J'Gween said, trying to get him to think about his climb-skill, so that the man would begin to move up the

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Tree again. "And too far ahead of the Mentsa."

"I had put in a stopper," Barth said. "It cut my fall. You had no reason to grab me. I could have taken the rope back up." He tested the guide's support loops with insulting moves, before trusting them to balance his weight and free his hands. Now, he was undoing the two entrier loops on his main rope. His motions made plain his feelings that this was extra work caused by J'Gween's interference.

"The Mentsa had some difficulty holding your fall," J'Gween explained. "She might not have been able to support your climb up the rope. On the Tree, it is always better to climb the bark surface than to hang on ropes or use artificial aids, Tsa Barth."

"Then let's climb, blast you! We're losing time again. I'm back on the Tree, aren't I? I've had enough of your advice. Climb!"

"The wisdom-words of a climb guide are his honor and duty," J'Gween said. "Will the Tsa Barth climb back to the Mentsa's position? We will wait for Tsa Barr to climb up, should it happen he is not there already."

"I'm ready to go on. I wasn't hurt."

"Of that I'm sure. But I must inspect the rope. It took an extreme strain."

"Another reason to delay? FitzRoi is getting further away. We'll never catch him. He only wants to climb this tree solo because somebody told him he couldn't do it. Or because its never been done. Once he gets to the top, he won't care about your tree grove down below. He'll blow it all over the map. I tell you we aren't climbing nearly fast enough. You're too damn cautious, Fuzz-tail. You've got us climbing too slowly. I don't think you want us to catch up to the Captain and his bomb trigger. This is surely no way to go about it. If you're going to stop every time something gets difficult, we'll never get to the top before Fitz-Roi."

J'Gween was undisturbed by Barth's accusations.

"That may be true, if-the-Tree-wills-it." he said, "But the Tree grows very slowly, Tsa. The top will still be there when we arrive. And it is still my honor to guide you. Are your ready to climb?"

"Yes!" Barth snapped. He jerked out the hex-nut on his anchor line and called out, "Tension!" to Jessica waiting above him.

The rope slithered upward as Jessica took out the slack loop and her call came back; "Ready!"

"Climbing," Barth said and he began to work his way up the tree, unclipping the extra safety line when he got level with J'Gween's anchor nut and deliberately leaving the rope and clip hanging for the guide to bring up.

J'Gween followed him, storing his equipment as he climbed.

Despite his comments about going on, Barth climbed back to Jessica's

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level then found a traverse and worked his way over the nose to where the woman was still holding a double-anchored belay. Doc was there beside her and had anchored himself in position to support her ropes. The stance Jessica had chosen, before the fall, was a wide ledge and there was room for the whole party. It was a good spot.

J'Gween followed Arden up to the stance and set his anchor-loops, then he said, "We will rest here a time while I check the rope, Tsarias. It is perhaps a time for food, if you wish it."

The second guide moved up beside his chief and reached for the rope at Barth's waist. Barth swung a flat-arm chop at the extended hand.

"Don't touch me!"

Aij A'Lween dodged the blow and moved straight up the tree, three steps.

"Hand me the ropes, Tsa," J'Gween said. "I must check for strain." He bent his head and placed his mouth over a section of the rope, holding it taut with outstretched arms, about a meter of rope between his hands. He began pulling the rope slowly through his mouth. His sensitive lips and tongue tested the rope, centimeter by centimeter, for signs of strain or indications of breakage.

At the same time, he was considering the ways he knew to check a *man* for strain. Except for his skill at finding holds, Tsa Barth was climbing like a cub. He was climbing too fast and without regard for the others. He was holding his belays with impatience, as an unwelcome break in his own climbing. He was challenging, fighting, the Tree, not climbing in harmony with the shape of its bark.

"*This is perhaps, a true climb-way for a climber of rocks and mountains,*" J'Gween thought to himself. "*But it is less-than-true as a Tree-way.*" And it was dangerous.

The Ca'tn FitzRoi was imperiling the sacred Grove Tree, truely...and, had he chosen to flee on the ground, through the forest, across the mountains, J'Gween would have agreed with the need for great speed...would have followed him to the limit of exhaustion, of himself and all in his party. But Ca'tn FitzRoi had not made those choices. He had chosen to climb the Tree. Therefore, J'Gween knew he had the powerful spirit of the Tree on his side in the chase. Ca'tn FitzRoi was climbing in combat with the Tree and that was very dangerous. It gave J'Gween a great advantage, and plenty of time. Climbing on the Tree was something that couldn't be hurried. There was always time because the Tree would help. J'Gween knew this with absolute certainty. In its own time, the Tree would strike Ca'tn FitzRoi.

But to have Tsa Barth also combating the Tree, that was dangerous to all in the party. J'Gween must take care that his party remained safe from the Tree's power. It would take night prayer drumming...and vigilance, for the Tree had already struck at the Tsa Barth, warning him against the hazard of his challenge.

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Perhaps it was a warning to them all. J'Gween meditated on what his own actions should be, as he continued testing the rope.

At one point he lifted his head, to relax and moisten his mouth and discovered Mentsa Jessica watching him intently, her half-eaten ration pack poised while her mouth was unconsciously formed in the same shape that his took over the rope. The expression in her eyes was interest, the look of a cub observing a new wisdom of climb-lore.

"If the rope has been strained beyond its strength, Mentsa," he explained, approving her curiosity. "The surface strands of the perlon will snap and stand up. In this way..." He touched his mouth. "In this way, I may feel the tiny barbs and broken fibers that are the rope's way of warning me that it may fail. You could, perhaps, feel them with your fingers, should it happen the climbing has not dulled your touch. If I find any, I will let you try. You could not use your mouth without some pain. It is a skill that must be practiced from cubhood."

"And one that is taking a lot of time," Barth said. He took a pair of gloves from his pack and drew them on with obvious gestures. "And its getting the rope all filthy dirty, so that a man can't touch it without getting sick at the stomach.

"We shouldn't stand still too long. My leg muscles will stiffen."

"My stomach has been stiffening for the last hour," Doc Barr said. "What's wrong with taking time out to eat? The idea of testing the rope doesn't make me sick."

"How long is that rope act supposed to take?" Barth demanded, ignoring Doc.

"Until I reach the end of the rope, Tsa," J'Gween said, bending back to the rope. A'Lween anchored himself beside his chief and gathered in the end of the rope. He too began to duplicate the strain check, acting as a safety backup to his chief, and coiling the rope around his shoulder as he finished.

"Grr! Fuzz-tails!" Barth said violently and turned his head away to stare out, and down, at the valley and the forest tops below. He would have walked away in disgust, except for the fact that he was tied to the vertical tree side, six hundred meters or more above the ground. The climb loops, clips and ropes tying him safely to the Tree took all of the dramatics of his snort of disgust; made him look a little foolish.

Jessica grinned quickly to herself, wiped the expression from her face and went back to watching J'Gween's rope testing.

The job didn't take long and J'Gween found no troublesome strain spots. He waited patiently until A'Lween confirmed his judgment and then handed him the coiled rope.

"The rope is strong," he announced. "We can go on if you are ready?"

"It's about time," Barth said. "Let me have the rope."

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J'Gween ignored him. Loosing his anchor lines to allow him to move over to the party, he clipped into Doc Barr's loop and began knotting the end of the climb rope into his harness.

"You should, perhaps, climb in short pitches..." he began.

"Hold one!" Barth said, snapping his attention back to the guide. "I lead this climb!"

"The tying-of-the-rope is my duty, Tsa," J'Gween said. He continued coiling out the climb-length of the rope between Barr and Jessica. "When the leader falls the guide must let him climb last on the rope until he has recovered his strength. This is a wisdom-of-the-Tree, Tsa. And it is my duty."

"Strength, you native ape! I'm strong enough to tear you apart. Who cares about your duty? No duty tells me where to climb!"

"It is the duty of the leader not to fall," Doc Barr said, dryly echoing one of the school posters they'd all laughed at, back at the Lodge.

Jessica laughed again as she lifted her arms to let J'Gween tie the rope. "Are you really going to make him climb last? Just because he fell?"

"It is the only safe way, Mentsa. None of you would have real confidence following Tsa Barth. You would be constantly alert for him to fall again, thus spending some of your own strength. It is not a good way on the Tree. This way he will build his own strength, the Tsa Barth, as he climbs, and Tsa Doc Barr, since he must consider your skill to protect him, will not climb too far on the rope. It is the safe way, Mentsa."

"I can protect him. *Tij*." she said, glancing over at Doc, speaking to reassure him rather than the guide.

"I was not worried, Mentsa. I have seen you climb. Later, I will ask you to lead so that we can spend the strength of all evenly." J'Gween passed the coil of rope to Jessica by hooking it on the tip of his tail and looping it across to her. Then he climbed over to Barth's support clips to help him tie-on.

When he came near, his hands were slapped away and Arden grabbed the rope.

"Don't touch me!" Arden said. "I'm still the leader of this climb. It's my party and I climb as Number One on the rope or we don't climb."

"That decision is always yours, on the Tree, Tsa," J'Gween said calmly. Then he raised his voice. "*Aij* A'Lween! Climb back along this pitch and find a spot where we may anchor the rappel ropes. We go down!"

"*Actch, Tij*." The second guide moved off, staying above the group and working to the rear.

"Hey, up!"

"No, *Tij*!"

"Wait!"

The two other climbers called their protests at once, Doc Barr perhaps a beat behind Jessica.

"You would, wouldn't you?" Arden snarled. "You fox-heads all stick together with your prayer drumming and holy trees. How about Fitz-Roi? Are you willing to forget all

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about FitzRoi and his bomb just so you can play chief guide? Quit! Go ahead. I've never needed one before this. A good reliable map would have been much better. Go on back! I can climb alone if I have to. FitzRoi is doing it."

"Not on the Tree, Tsa," J'Gween said stiffly. "I have contracted to lead a party. A party will climb . . . or a party will go down; as you choose."

"Barth stood staring at the guide, his fingers digging deeply into their handholds, his back stiffening as his anger increased. When he finally spoke, his voice was tuned as tightly as a stretched rope. "Very well, guide. I will climb up, not down. At the end of the rope, if I must. But, up! He tied the rope to his harness with savage jerks, using one hand.

J'Gween called, "*Aij*! Return" and turned to climb back toward Barr. He gave no sign that he considered Arden's change a victory. It was not. J'Gween realized that he had simply been late in recognizing an old familiar problem. He had not been alert for the usual signs. Tsa Barth was caught in the grip of a climbing fever.

The guide balanced himself against two quickly set nuts and pulled his drumsticks down into position from the top of his pack. He stroked his signature cadence, causing the climbers to turn startled faces toward him. Barth started to curse, but J'Gween's drumming drowned out his words.

The village drums surged and flowed through the air around the party, their volume increasing and matching J'Gween's stroking.

The village drums surged and flowed through his being; *"Brother, Tree Brother. Do not stop the climbing. You must reach the Ca'tn FitzRoi. Do not return. do not return."*

"Do not fear, Hearth Brothers. Do not fear." J'Gween's emotion was soothing in reply, meeting the drumming rhythm. Tsa Barth would never climb down the Tree, now. The climbing fever had claimed him.

"He climbs with the Tree fever, Hearth Brothers. He climbs alone with the Tree in his mind. He climbs against the Tree. He combats the Tree."

"Let him climb, Brother. Let him climb." the drums beat strongly from the ground. *"The contract has been said and the Grove is periled. Our drumming will guard him.Do not climb down."*

"Tsa Barth will not climb down. He is climbing the Tree." J'Gween repeated the theme. *"The Tree. The Tree. The Tree. His climbing will not be over until he reaches the top. Threat—emergency—guide, nor friends, will not stop him, Brothers. He combats the Tree."*

That was right, Barth had begun to fight the Tree instead of climbing it and his combat wasn't over with just one fall. No, not yet. The Tree could still find a way to strike at him and

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defeat him if he kept on fighting.

"Hearth Brothers there is danger to my party. They climb in danger." J'Gween spread his worry down the drumbeat. *"Tsa Barth and the Ca'tn FitzRoi are sharing the same combat now. They both are climbing alone—against the Tree, Brothers. Danger. Danger. There is danger. Guard us. Brothers."*

"Let them climb, Let them climb." The drumbeats took on a vibrant note, swelled louder in J'Gween's hearing. *"We will guard. We will drum to guard. Climb! Climb! Climb!"*

Then for moments the drums carried no message, just power and soothing confidence, flowing strength back into J'Gween, giving him the guarding power he needed. He timed the rhythm of the beat and when it reached its height and sank away to barely audible pulsing, he moved to go on with the climb.

"When you are ready, Tsa Barr," he said with gentle professionalism. "Tsa Barth's climb loop is still in place—out there. I would suggest that you put another in, between here and there, then keep that spacing, as you climb. There is a good belay point just above the Tsa Barth's last loop. You will see it."

Doc Barr nodded, looked back at Jessica and asked, "Ready?" Jessica had already looped the rope around her shoulders and was standing in the same position she had taken to belay Arden. Reluctantly, but with his usual skill and precision, Barth took up the slack in the rope connecting him to Jessica, locked the rope around his shoulder and stiffened his left arm into its hold. He didn't like the idea of being last on the rope, but he was ready to give Jessica additional support. Jessica said, "Belayed, Doc."

"Right-oh. Here we go. Climbing!" Doc stepped up to the next foothold and wormed his way over the nose and out of sight. Jessica held her belay position easily, without tension, paying the rope out as Doc moved away up the Tree. Finally his call, "I'm set come ahead," told her that he'd made the climb.

"Tension," she called, flipping the belay loop over her head and letting Doc pull the rest of her rope out across the Tree. Barth unclipped his anchor loops, moved up to pick up Jessica's belay position, set himself, and nodded to her.

"Go ahead." he said. "We've still got to catch FitzRoi sometime on this senseless climb. Go ahead! Belayed!"

Jessica unclipped from the anchor loop and began to climb toward the unseen Barr, calling, "Climbing!" He moved easily from hold to hold.

J'Gween moved off, away from Barth's stance climbing to get ahead of Doc Barr and back into his guiding position. The group had begun to climb with good skill and A'Lween had come back to position himself behind the last climber. J'Gween went forward to guide. The wavering drum pulses following him. ■

TO BE CONTINUED

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AMERICAN ENTHUSIASM FOR SPACEFLIGHT

Our future in space depends on public support. How does the public feel about it?

WILLIAM SIMS BAINBRIDGE
AND RICHARD WYCKOFF

All great human enterprises are primarily social. The space program is no exception. It could not exist without social support, without the enthusiasm of national leaders and the acceptance of the general public. Great technical advances would be impossible if there were no one willing to pay for them. To use the metaphor of war: The attempt to conquer space will be won or lost on the home front. The Second World War was decided as much in the factories as on the battlefields; the Vietnam War was a disaster of the spirit, not a failure of technology. This article examines the quality of support given the space program by citizens of the United States. We not only report the general level of enthusiasm for spaceflight among the American public, but go beyond this superficial question to probe opinions on specific aspects of the space program. In doing this, we develop and analyze a coherent set of justifications for the space program—the Ideology of Spaceflight.

The best place to start is at the economic basis for the program. Figure 1 shows the appropriations for the National Aeronautics and Space Administration for the years 1960-1977. There are other space-related budgets, of course. This graph ignores American military space expenditures as well as programs of the Soviet Union and other nations. But NASA carries out many of the most future-oriented projects, so its vitality is a good indicator of the general health of space agencies. The graph gives not only the appropriations for each year, but also the real wealth in

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1960 dollars, adjusted for inflation in the consumer price index.

Figure 1 tells a familiar and frustrating story. NASA funding leaps upward in the early 1960s, reaching a peak of $4,906,500,000 for 1965, then gradually staggers down again. Although it appears that funding has been rising again since 1974, really it has been just holding steady, and increased dollar appropriations have merely offset inflation. Another way of looking at NASA appropriations is in terms of the percent of the Gross National Product invested. The peak year in terms of GNP was 1964, when NASA took 0.8 percent of the total goods and services produced. For 1977, only 0.2 percent of the GNP went to NASA, making it the lowest year since 1961. This fifth of a percent represented an average of only seventeen dollars from each citizen.

Another indicator of support for spaceflight can be found in congressional voting patterns. An average of 374 members of the House of Representatives participated in the final vote on NASA appropriations for the fifteen years 1962-1976. Eighty-five percent voted in favor of the NASA bill, in a typical year. Of course, the funding request from NASA passes through the executive branch and various congressional committees before it comes to a vote on the floor of the House, so the 85 percent figure expresses satisfaction with the *trends* in space funding, rather than a desire to increase appropriations. When we analyzed voting patterns, we were surprised to find that Democrats were more supportive than Republicans. On the average, 89 percent of the Democrats voted in favor, as opposed to 80 percent for the Republicans. There is a slight downward trend in the over-all figures. The "yea" votes dropped from 90 percent for 1962-1968 to 83 percent for 1970-1976. Does this mean that House members wanted NASA appropriations to drop even lower than they have? Not necessarily. Political factors unrelated to spaceflight may be at work. Representatives whose party holds the White House tend to vote with their president, while the other party is more likely to vote against him, and NASA funding requests come to the House from the Administration. In the first half of the fifteen-year period, Kennedy and Johnson held the White House, followed by the Nixon-Ford years. Under Democratic presidents, the Democrats gave an amazing 99 percent "yea" vote, which dropped to 82 percent under Nixon and Ford. The Republicans gave only a 77 percent "yea" vote for 1962-1968, which rose to 82 percent for 1970-1976. Since Democrats outnumber Republicans, their votes dominate the over-all pattern. Thus, the apparent decline in space voting may just represent the change in administrations. Congress seems satisfied with the trend in NASA funding, including the current steady level of appropriations. According to competing theories of our government, the Congress either leads or follows

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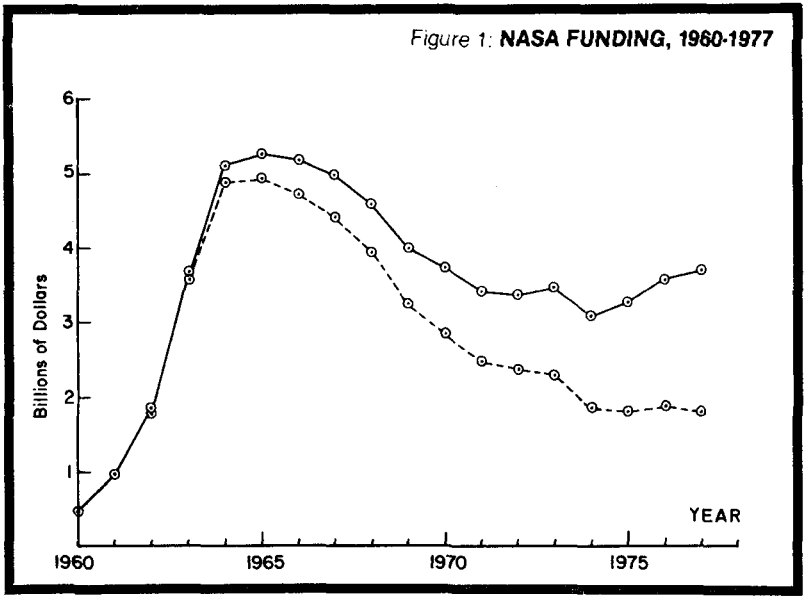

This graph shows the great leap in NASA appropriations during the early 1960s, and the gradual decline that followed. The solid line represents the actual dollar appropriations for each year. The dashed line corrects for inflation and shows the actual wealth invested.

public opinion. Whichever theory is correct, the attitudes of ordinary Americans can tell us much about the nature and sources of support for spaceflight.

The American public is not very enthusiastic about the space program. After the profound shock of Sputnik, U.S. citizens quickly returned to a mood of indifference concerning space exploration. In 1969, the year of Apollo 11, the Gallup Poll asked a national sample of 1500 adults what should be done with space funding. Only 15 percent wanted appropriations increased, while 43 percent said funding should be kept at a constant level, and 42 percent wanted investment in space reduced. For the past five years, the National Opinion Research Center has included a similar question in its annual survey. In 1977, 10.7 percent of the 1440 Americans who answered felt that "too little" was currently being spent on the "space exploration program." Another 36.6 percent felt the level of funding was "about right," while fully 52.7 percent felt that "too much" was being spent on space.

It is hard to find an optimistic way of looking at these figures. In 1969, a

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Figure 2:
PUBLIC SUPPORT FOR ELEVEN GOVERNMENT PROGRAMS

Program	*Percent who Want More Money Spent on this Program*
Halting the rising crime rate	70.0%
Dealing with drug addiction	59.5%
Improving and protecting the nation's health	58.5%
Improving and protecting the environment	51.2%
Improving the nation's education system	49.5%
Solving the problems of the big cities	46.9%
Improving the conditions of Blacks	27.3%
The military, armaments and defense	25.7%
Welfare	13.0%
The space exploration program	10.7%
Foreign aid	3.7%

These figures are based on a national survey of over 1500 randomly selected American citizens.
Source: Cumulative Codebook for the 1972-1977 General Social Surveys, National Opinion Research Center, University of Chicago, 1977.

majority of people wanted space funding maintained at current levels, or even increased. But the 1977 survey shows a clear majority in favor of cutting back funding. Of course, many Americans resent the heavy taxes they are forced to pay. About 70 percent of the respondents to the 1977 survey said federal income taxes were too high, so perhaps the lack of support for an expanded space program merely reflects antagonism to government spending of any kind. How does the public feel about other government expenditures?

Unfortunately for space progress, the public is far more enthusiastic about programs that promise immediate benefits to the average person. Consequently, resentment over high taxes may cause reductions in programs like space exploration which do not seem to meet pressing current needs. The 1977 survey asked respondents their opinions of eleven different government programs, and only one proved less popular than space exploration. Figure 2 shows the percent of citizens in favor of expanding each of the programs. There was much concern over widespread social problems, such as the rising crime rate, drug addiction, and the problems of the big cities. Respondents were also interested in improving the quality of life in America, bettering the nation's health, the environment, and the education system. The space program ranks way down with such unpopular "giveaways" as welfare and foreign aid.

Many polls have confirmed that Americans are not very enthusiastic about spaceflight. But we would like

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to know much more than this simple, melancholy fact. Why do people feel as they do? Which kinds of space project do they favor most? Which kind of space program would get the most support? Which justifications for continuing space development are most convincing to the average American? None of the national polls have asked these important questions. We decided to tackle the problem ourselves with a new questionnaire entirely about spaceflight.

First of all, we needed good questions. Social scientists, like other craftsman, are only as good as their tools. Rather than try to find the right questions in our own imaginations, we performed a preliminary study to develop the fullest possible set of ideas about the potential value of space. To get the widest range of opinions, we surveyed three very different groups: the American Institute of Aeronautics and Astronautics, the Committee for the Future, and the science fiction subculture.

The AIAA is the most prestigious large scientific-engineering organization in the aerospace field. From a random sample, 102 members of the AIAA responded to a mailed questionnaire asking for several statements about the value of the space program. The Committee for the Future is a quasi-religious group that was dedicated to the great goal of interplanetary colonization. We collected justifications for spaceflight from CFF literature, from tape recordings we made of speeches at two CFF conventions, and from a questionnaire filled out by 80 participants at one of the meetings. The science fiction subculture is a diffuse network of writers, readers, and dedicated fans. To get statements from them, we recorded interviews with 58 participants at a large science fiction convention, and administered questionnaires to 74 members of the New England Science Fiction Association, one of the best organized clubs.

This produced a tremendous amount of data. To analyze it, we went through all the recordings and questionnaires, copying down every statement that was an answer to the implicit question: *Why should we continue the space program.* Each statement was typed on a large file card, a total of 1256. The largest number, 620, came from members of the AIAA, while 340 were contributed by science fiction fans, and 296 came from the Committee for the Future.

The next step was to reduce the 1256 statements to a more manageable number. Many of the cards really said the same things. For example, many mentioned something about communication satellites. We carefully sorted the cards into groups that seemed to be expressing single main ideas, winding up with forty-nine. Using wording on the cards, we wrote a summary statement on behalf of each group. These 49 justifications for spaceflight are the focus of the remainder of this article. We built our questionnaire around them. The respondent was asked to say how good

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a reason for supporting the space program each one was: "not a good reason," "slightly good reason," "moderately good reason," or "extremely good reason." We also included a few miscellaneous questions. The questionnaire was mailed to a random sample of Seattle area voters.

A total of 225 questionnaires were returned properly filled out. The voters held a wide range of opinions, but there were consistent patterns. Some of the statements got a very favorable response, while others received poor ratings. Communication satellites headed the list, with 68.8 percent of the voters calling them an "extremely good reason" for continuing the space program. Lowest on the list with only 4.5 percent, was the statement: "Without spaceflight we would be trapped, closed-in, jailed on this planet."

But the questionnaire was designed to be more than a popularity contest. We also wanted to discover the essential concepts behind all the many ideas about the value of space. That is, we wanted to delineate the *conceptual structure of the spaceflight ideology.* How do different ideas cluster together? What principle unites all the ideas in a cluster? What are the underlying values that are served by the conquest of space?

Figure 3 shows a first attempt at defining the structure of our 49 statements. We have simply graphed them in two dimensions. Each dot represents one idea. The vertical axis represents the *popularity* of the different justifications for spaceflight. For each one, we added together the percentage of the 225 respondents who said it was either a "moderately good" or an "extremely good" reason for continuing the space program. Thus, the "popularity rating" for communication satellites is 89.5 percent, while the new scientific knowledge gained through space research has a popularity rating with our Seattle voters of 85.5 percent. These are the two most popular justifications, but as Figure 3 shows, the 49 statements cover a wide range of popularity, and several are very near the top.

The horizontal axis is based on the political orientation of the respondents, determined through one of our miscellaneous questions. The unit of measurement is a correlation coefficient which we need not explain here. Suffice it to say, statements with a "politics score" more than 0.2 points from zero are favored by voters at one end of the political spectrum much more than by voters at the other end. Perhaps the most important things displayed by Figure 3, and verified by evidence from several other research projects, is the fact that there is *no general relationship between political orientation and support for the space program among the American public.* Liberals and conservatives give about the same level of support. If there had been a strong political influence on support, Figure 3 would have looked very different. The dots would have been displaced significantly to the

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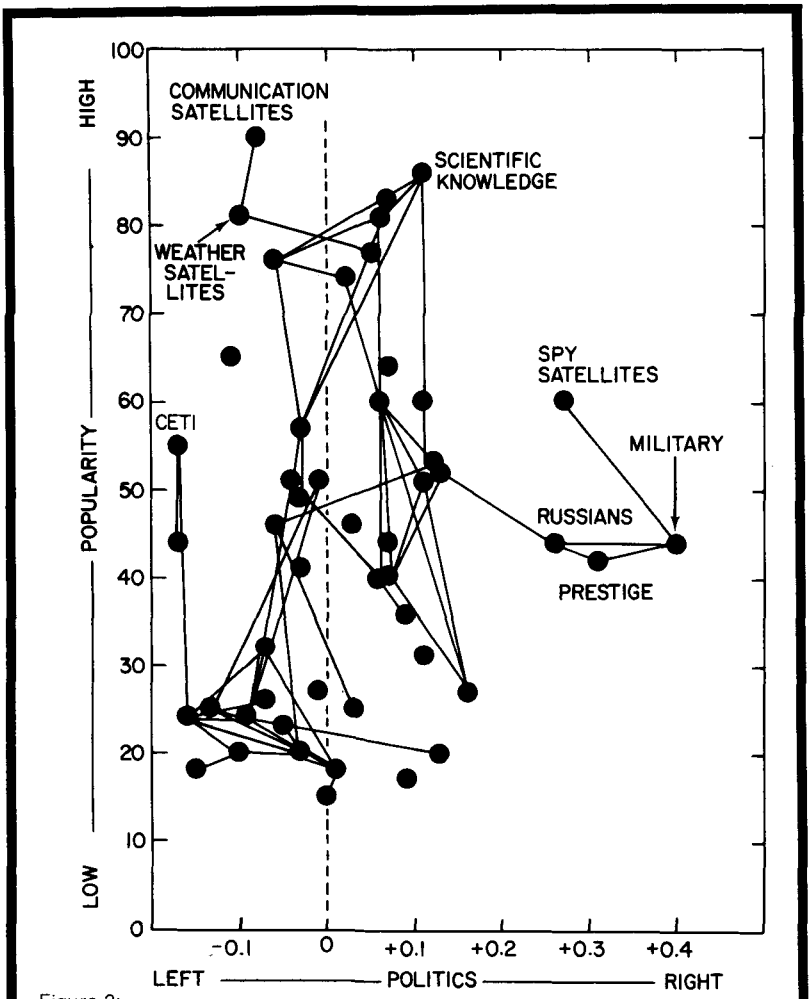

Figure 3:
STRUCTURE OF THE SPACEFLIGHT IDEOLOGY

This is a first-approximation look at the conceptual structure of the spaceflight ideology. Each dot represents a different justification for the space program. The lines represent correlations linking some of them. Except for the four military items at the right, the justifications are not greatly associated with conventional political ideologies.

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right or left of the zero line. But we do not see this. Forty-five of the dots run in a narrow rectangle centered right on the zero line.

The lines connecting several of the dots represent correlations between them. That is, voters who favor one item will also tend to favor any items to which it is connected. For example, there is a line connecting communication satellites with weather satellites. This means that people who think one is "extremely good" will probably feel the same about the other. People who rate one lower than other people do, will tend to have a relatively negative opinion of the other as well. These lines represent the internal structure of the ideas, linking ideas that share some common principle to which people respond in a fairly regular way. In a moment this interpretation of the lines will take on some importance, but first, let us scan the diagram with our eyes and see if we can spot obvious structures within it.

We have to admit the shape is irregular. It has none of the beautiful symmetry of a DNA molecule. But there are patterns and clusters. The most prominent feature is the arm of four statements reaching out to the right. These are the *only ones* in the entire set with strong political overtones. Conservative voters rank them much higher than do liberals. These four dots are connected by lines, indicating that people respond to them as a group of ideas sharing some common characteristic. How can we tell what it is? We have to compare the meanings of the statements. One says that space has military applications; another urges us to keep ahead of the Russians. The third says that the space program boosts American national pride and prestige in the world. The most popular one states the importance of spy satellites for military reconnaissance. Clearly, these four contain a common concern for the military and world-political status of the United States. It is no wonder that these items are favored by politically conservative voters.

Our eyes find it more difficult to spot other structures. There is a little arm to the left, but not significantly far to the left, ending in "CETI"—communication with intelligent beings from other planets. There seem to be groupings inside the main body, but what are they? Our eyes may deceive us. Is there a scientific procedure for discovering such internal structures?

In fact, there are several kinds of statistical analysis that can process the vast amount of information crudely represented in Figure 3 and identify dimensions and clusters. We used one of the most common, *factor analysis.* This procedure starts with the opinions of our 225 voters on each of the 49 items, a total of 225 x 49 = 11,025 pieces of information. It first produces a matrix of correlations between all pairs of items, expressing the degree of association linking each pair. Again, the lines connecting dots in Figure 3 are crude representations of the strongest correlations we found. The correlation coefficient

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linking weather and communication satellites, for example, happens to be 0.51655, a number whose meaning need not concern us here, but which had to be calculated as a step in the factor analysis. The basic correlation matrix contained 49 x 48/2 = 1176 such numbers.

Our computer was instructed to look for "factors" in this matrix. Each factor is a cluster of intercorrelated items that elicit similar patterns of response from the voters. The computation procedure is entirely mechanical, but we ran several such analyses, cutting the structure into few or many pieces, comparing the solutions to see which one did the best job of clustering ideas into mathematically sound and meaningful groups. The best solution produced five factors, collecting into groups 40 of our 49 statements, with nine left over that had few connections with other statements.

For an example of the results, we show the smallest of the five factors in Figure 4. There is no problem recognizing this factor. It is the cluster of four military-political ideas we were able to spot in Figure 3. The "factor loadings" listed in the table are the actual coefficients in the computer print-out that tagged these four as members of a single factor. The computer prints a number of columns, one for each factor, giving the "loading" for each of the 49 items. High numbers (approaching 1.0) identify items that are in the particular cluster. All four of our military statements have loadings on this factor above 0.5, while the average of the other 45 is only 0.127.

Factor analysis does not always work. Because it is entirely mechanical, it sometimes "finds" structure when there is none, grouping items together in meaningless bunches. One reason we know our analysis worked well is because the loadings were fairly high. Another reason is that we got the same factors, basically, when we forced the computer to group the data into more or fewer factors. But the final test is always the intelligibility of the different factors. They are no good unless they *mean* something. We believe that each of our five does in fact represent a basic motive for supporting spaceflight.

Figure 5 shows one of the biggest factors, a cluster of ten ideas listed in order of their loadings, the order in which those items that express the factor's key ideas best are found at the top. Simply reading the first three statements immediately tells us what the factor is about. It urges *colonization* of outer space. Each statement either tells us that we ought to colonize the planets, or describes what good things we might do in our colonies. Of course some of the ideas are more reasonable or more popular than others, but every single one is about colonization. Therefore, we can call this the COLONIZATION factor. After inspecting the other factors, we have named them: EMOTIONAL-IDEALISTIC, ECONOMIC-IN-

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Figure 4:
THE MILITARY FACTOR

Factor Loading	*Popularity with Voters*	*Statement*
0.773	44.0%	Space has military applications; our nation must develop space weapons for its own defense.
0.739	41.7%	Space is an important arena for international competition, and if we do not keep our lead, the Russians will gain an advantage over us.
0.608	43.6%	The success of the U.S. space program increases our prestige in the world, demonstrates the value of democracy, and renews American national pride.
0.560	59.8%	Military reconnaissance satellites (spy satellites) further the cause of peace by making secret preparations for war and sneak attacks almost impossible.
0.127	45.4%	average of 45 other statements

"Popularity" is defined as the percent of 225 Seattle voters who feel the statement describes a "moderately good" or "extremely good" reason for supporting the space program.

DUSTRIAL, and INFORMATION.

The EMOTIONAL-IDEALISTIC factor mentions a number of personal feelings and spiritual motives that might be served by spaceflight. It says we must explore space to satisfy our great curiosity and in search of fun, excitement and adventure. Space provides a challenge and a goal for mankind, an outlet for human aggressive instincts, and may help bring about global renewal on Earth. Space enlarges the mind and the spirit of man, and will teach us to love and respect our own planet. The factor even includes the following personal statement: "I am in favor of the space program because I would very much like the experience of travelling in space myself."

The ECONOMIC-INDUSTRIAL factor talks about the job opportunities and economic stimulus provided by the space program. It says we must continue the program in order to maintain the quality of American technology and so that our highly trained manpower will not be wasted. It says the space program encourages young people to choose careers in science and technology, and that the program is a good training ground for scientists and engineers. Finally, the factor mentions spinoffs: "Space technology produces many valuable inventions and discoveries which have unexpected applications in industry or everyday life."

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Figure 5:
POPULARITY OF STATEMENTS IN THE COLONIZATION FACTOR

Popularity with Voters	*Statement*
24.7%	Overpopulation on Earth can be solved by using the living space on other planets.
23.6%	Space travel will lead to the planting of human colonies on new worlds in space.
24.2%	Society has a chance for a completely fresh start in space; new social forms and exciting new styles of life can be created on other worlds.
50.9%	Raw materials from the moon and other planets can supplement the dwindling natural resources of the Earth.
17.6%	Our world has become too small for human civilization and for the human mind; we need the wide open spaces of the stars and planets to get away from the confines of a shrinking world.
25.8%	Spaceflight is necessary to ensure the survival of the human race against destruction by natural or man-made disaster.
32.2%	Human societies have always needed to expand in order to remain healthy; space is the only direction left for such expansion.
20.4%	We must go beyond the finite Earth into infinite space in order to continue economic growth without limit.
50.9%	Space hospitals put into orbit where there is no gravity will be able to provide new kinds of medical treatment and give many patients easier recoveries.
40.3%	Commercial manufacturing can be done in space without polluting the Earth; completely new materials and products can be made in space.

The INFORMATION factor lists ways that space contributes to the discovery and communication of new knowledge. It lists four already successful programs: navigation satellites, Earth resource satellites, and communication satellites. These systems collect and distribute *information*. This factor includes the same spinoff item as the ECONOMIC-INDUSTRIAL factor. This is the only statement shared by two factors, and it clearly does have both economic and informational aspects. The factor suggests that "Space technology will allow us to manage the environment of our planet because it is developing techniques for managing artificial environments that support human life." The key principle is information, whether of an immediately practical or more abstract nature: "Space development will give us new practical knowledge that can be used to improve human life." "Space exploration adds tremendously to our scientific knowledge."

Now that we have discovered the five main motives served by spaceflight, we can measure their relative

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Figure 6:
POPULARITY OF JUSTIFICATIONS FOR SPACEFLIGHT

Group of Justifications	*Opinions of 225 Seattle Voters*	*Conservative Estimate for Total U.S. Adult Population*
INFORMATION Factor	78.7%	69.8%
ECONOMIC-INDUSTRIAL Factor	52.8%	41.9%
MILITARY Factor	47.3%	40.7%
EMOTIONAL-IDEALISTIC Factor	34.0%	27.9%
COLONIZATION Factor	31.1%	24.7%
9 Unfactored Justifications	45.1%	39.4%
All 49 Justifications	45.5%	38.4%

"Popularity" is defined as the average percent of 225 Seattle voters who feel the statements in a group describe "moderately good" or "extremely good" reasons for supporting the space program. The "conservative estimate" is also based on the opinions of Seattle voters, but uses data from a national poll to adjust the figures downward.

acceptance by the American public. Which ones are most convincing to the average citizen? Which ones can be used to convince the average citizen to support the space program? Figure 6 gives the average popularity of the statements in each factor. The first column of figures reports the responses of our Seattle voters. But perhaps Seattle is not typical of American cities. Perhaps our figures are biased, overly positive because some voters who are not interested in space did not care to return their questionnaires to us. Such possibilities would not cause much trouble for our factor analysis, because correlations between statements would not be greatly affected by the over-all level of enthusiasm. But our very important popularity estimates are somewhat sensitive to any differences between our respondents and the average American voter. Therefore, we used information from the miscellaneous part of the questionnaire to calibrate the study and produce the most conservative plausible estimate to compare to the unadjusted figures.

The very first item in the questionnaire was the question used by Gallup in 1969 to measure support for the space program. The respondents to our questionnaire were more enthusiastic than the average citizen about the space program, 23.7 percent of them calling for an increase in space funding, as opposed to the much lower 10.7 percent reported from a national poll in Figure 2. We recalculated each popularity estimate separately, extrapolating downward, then recombined them to give the factor estimates. That is, we statistically predicted how our Seattle voters would have responded to each item if

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they had been just as unenthusiastic about space as the average American. In an article published in *Astronautics and Aeronautics* (June 1978), we used the old Gallup poll figures to produce moderately conservative estimates. Here, we arrived at conservative estimates using data from the 1976 poll of the National Opinion Research Center, a survey that found even lower support for spaceflight than the 1977 poll. In 1976, fully 61.9 percent of the respondents wanted space expenditures reduced, and only 9.4 percent called for an increase. This gave *conservative* estimates, which may be too low, a rock-bottom pessimistic guess at the popularity of each factor.

Both columns of popularity estimates rank the five factors in the same order, so either is good for comparing them. In each case, the true popularity is undoubtedly somewhere between the two estimates. This means that the table contains some very encouraging findings. The most popular factor, INFORMATION, gets a favorable response from a solid majority of Americans, even in the conservative estimate. Two other factors, ECONOMIC-INDUSTRIAL and MILITARY, are within striking distance of a majority. These three factors contain many statements that refer to benefits that the space program has already achieved. Thus, Americans are most enthusiastic about practical payoffs and do appreciate the major accomplishments of the space program.

But Americans are not enthusiastic about potential revolutionary long-range goals in space. They are not impressed by emotional and idealistic motives, and they give the lowest rating of all to interplanetary colonization. If we want to stimulate public support for the space program, we should emphasize practical, immediate, scientific and informational benefits, giving second place to economic motives. It is no good to try to sell the colonization of space.

Four of the statements that refused to fall into clusters in the factor analysis received relatively high popularity ratings from Seattle voters. Nearly three quarters, 73.9 percent, expressed general faith in space exploration by agreeing that "space will be of value in ways we cannot yet imagine." The idea that "space can provide a focus for increasing international cooperation leading to world unity" was favored by 62.4 percent. A practical idea, promoted heavily by NASA and by aerospace companies *after* our survey was completed, got a 60.4 percent rating: "Electric power generated in space and sent down to Earth will help solve the energy crisis without polluting our environment." Finally, a project on NASA's drawing boards and long a favorite of science fiction writers received a 53.0 percent rating: "Communication with intelligent beings from other planets would give us completely new perceptions of humanity, new art, philosophy, and science."

What conclusions can we draw from this survey of Seattle voters?

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Most importantly, although public support for the space program is weak, *some* goals and projects of the program are in fact very popular. The public appreciates what has already been achieved. Not only does the majority feel that the knowledge gained through space research is valuable, but it also hopes for future benefits that cannot even be imagined today. While the public is not yet ready to support colonization of the solar system, it is ready to support some steps that would eventually lead to colonization. For example, Americans believe that space may become an important source of raw materials and energy. In a few years they may be prepared to invest in aggressive programs to attain this objective. About half of the public is excited by the idea of communication with extraterrestrials, and would look favorably on a CETI project. The single questions on space included in national polls have provided only bad news; our much more detailed study of Seattle voters uncovered some good news.

American enthusiasm for spaceflight may not be great, but it is complex. Americans hold a wide range of opinions about many different justifications for the space program. Three of the five basic motives for space travel receive comfortable levels of acceptance. Although the public is not willing to pay for a great thrust forward in space development at the present time, it does want gradual expansion of our spaceflight capabilities. Furthermore, our data show that several potential sources of greater future support exist. If Russian aggressiveness continues much longer, the Military Factor will cease to be a right-wing motive for spaceflight, and will receive greater emphasis as an expression of American consensus. When orbiting solar power facilities are shown to be feasible, the public will demand them. Anything that can focus enthusiasm for communication with extraterrestrial intelligence could boost the space program. Thus, unlike the simplistic national polls, our detailed survey has found much cause for optimism. It was as if we had surveyed the instrument panel of the good spaceship *Spaceflight:* We saw little thrust from the engines at the moment, but all systems are go, and several instruments indicate the possibility of future high acceleration. ■

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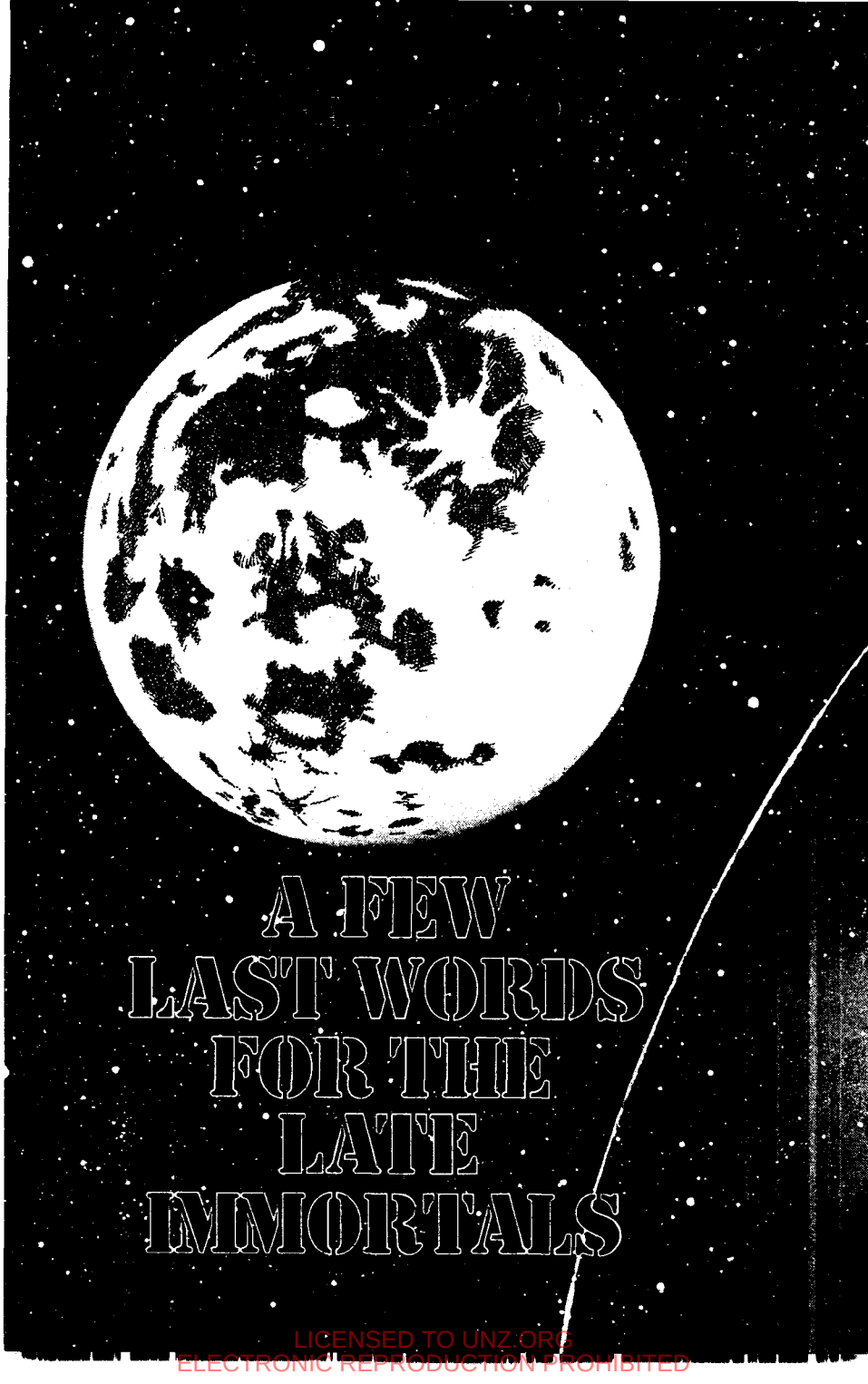

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Few things are Forever. Even immortality . . .

The alien, in her accompanying plasmic aura, strolled through the hall of a computer mausoleum on Titan. Of an eerily exaggerated tallness here, she resembled in her interior structure the gaseous-blue skeleton of a great, long-armed bird. Now and again she paused to peer tenderly at the banks upon banks of dead machinery and electronic units. One chronometric mechanism, still faintly aglow, gave in digital form a remorselessly sequential declaration of the time and date:

0104 5 Nov 3011 anno Domini

Lwevshed—for this was the alien's name, insofar as it admits of approximation—illuminated the computer hall's corridor. She explored its console-peopled recesses and its dust-haunted crannies. After the manner of an archaeologist sifting through ruins, she examined its minutest particular and tried to make connections. Outside, Saturn hummed like a clock.

0107 5 Nov 3011 anno Domini / 0108. . .

Seeking in the out-of-time computer hall to orient herself within a chronological matrix no longer in use anywhere, Lwevshed recognized and accepted the alien characters of the time-keeping device. She made herself believe in them. It was very difficult. Still, her mind made the complicated transliterations in such a way that her emotions shifted out of Loshaibron modes of perception/being into the anachronism of a human cultural attunement. She was by will and practice a human female in a place where no one like the entity she impersonated had set foot in—well, in over six *decades.* The strangeness of this fact tingled the aura of the Loshaibron female with many bright starbursts of color: the mute music of her glowing vertebrae.

0112 5 Nov 3011 anno Domini / 0113. . .

As she strolled, a message—keyed to a linguistic subset with the cultural ground to which she had utterly given herself—penetrated her aura and reminded her that she had connections both ancient and immediate on the surface of this inhospitable moon. The message was repeated, and she paused in her explorations to accept it.

—Condition of alien facility?

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—Dead, she responded.—Utterly uninhabited.

—Tell us what you can, Lwevshed. Glean what you can from the equipment and give us a report.

After a time she found a machine, an electronic unit, that she was able by a clever insinuation of her essence to reanimate and converse with.

—For a time they were immortal, she told the Loshaibron entity who had interrupted her stroll and commanded her obedience.

—For a time?

The machine began dredging up fact after fact about the species' historical development, and image after illustrative image. Each pictograph and accompanying capsule essay was stylized and spare, in keeping with the smallness of the computer's display screen. Lwevshed submerged her newfound "humanity"—her sense of identification—just enough to nudge these symbols into a mental code suitable for retransmission to her superior. Nevertheless, she remained human on a perplexing emotional level, and the computer synopsis of the species' evolution held her enthralled.

Australopithecine africanus. Homo habilis. Homo erectus. Homo sapiens. Homo sapiens sapiens. Homo sapiens immortalis...

—But you have told us they were *briefly* immortal, Lwevshed. Skip ahead. Skip far ahead in this catalogue and explain to us how such a thing came to be.

Lwevshed skipped far ahead. The successive images on the display screen collapsed upon one another as if from an infinity of directions and planes. Then she slowed the dizzying rush of imagery and data and held a random segment of *Homo sapiens immortalis*'s history on the tiny screen.

—Broadcast, her superior told her.

Lwevshed obeyed:

[Moscow, 2034. Newspaper article from the Murmansk Times-Mirror.]

Eighty-one-year-old politburo official Viktor Stavrin and his 28-year-old grandson Yevgeny have just celebrated the fifth anniversary of their unusual parabiotic marriage. Joined back to back in an 18-hour surgical procedure allowing them to share a common circulatory system, Viktor and Yevgeny insist that they remain not only loving relatives but very good friends.

"How can I not love this boy?" asked Viktor upon being questioned by the press. "Parabiosis has reduced the levels of death hormone in my bloodstream and significantly lowered my cholesterol level as well."

"Is that all?"

"Of course not. After nearly seventy years of improper sleep habits I have at last learned how to lie comfortably on my side. This sweet boy has taught me that."

Remarked Yevgeny, "What my grandfather says is very true. He had aged prohibitively before the advent of the Hayflick treatments, you see, and could not safely undergo them."

"So the parabiotic technique was instead employed?" asked a reporter.

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"Certainly," said the young man. "My readiness to permit this particular hookup is a measure of my desire to extend the life of my beloved grandfather, who also just happens to be a very valuable party member."

When asked if the parabiotic arrangement wasn't likely to shorten his own genetically allotted span, Yevgeny replied, "Oh, no. My grandfather and his doctors all assure me that I will live to the full limit of my years."

Then, like convivial Siamese twins, grandfather and grandson danced back and back around their hospital room. Their step was light, witnesses declared; their synchrony, flawless....

Lwevshed lifted her narrow head. Nearly a thousand E-years later, in a computer mausoleum on a moon of ice and methane, it seemed to her that she could hear the echoes of the men's celebratory footfalls. How strange, how risible, how melancholy.

—Parabiosis? her superior said. —A dead-end technique, especially if they had already begun to develop biochemical methods of prolongation. Skip ahead again. Skip ahead a century or so.

The solitary Loshaibron explorer obeyed her superior's command:

[London, 2241. Comfax advertisement.]

WorldWide Life Insurance, Ltd., announced early this year that it is permanently dismissing the last of its human field representatives.

Henceforth, all straight-life policies (viz., those with clauses excluding accidental termination) are available through direct application to our London terminex, said WorldWide spokespersons. Cost is 20 Nuppence, or new pence, a year. Rates automatically decrease by a fourth every fifty years, eventually leveling out to an annual premium of one tax-exempt Hayflick Penny, provided holder demonstrates that his treatments continue unabated.

Accidental-termination policies, said a company official, are undoubtedly a wiser investment for most citizens with up-to-date biomedical clearances. These are generally available for 1,000 Nuppunds (new pounds) per annum.

So far insurability has been denied only to astronauts, recidivist hunter-gatherers, leisure-hour mercenaries, professional deathball players, the members of holo-entertainment stunt guilds, the certifiably masochistic, immuno-system deficients, and miscellaneous others.

WorldWide also reminds the public that "term insurance" is NOT synonymous with "accidental-termination" coverage. Please tap in to your private terminex for details:...

—Incomprehensible, said Lwevshed's superior in a tone of bewildered irritability. —Except insofar as it vaguely suggests the certain existence and the societal impact of their pro-

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longation techniques.

—Skip ahead?

—Please, Lwevshed. By all means, skip ahead.

—How far?

—Two additional E-centuries, more or less. And see if you can't find a readout of some private emotional significance. In many ways, these last two accounts have seemed peripheral to our pursuit.

—Very well.

Half transfixed by the glow of her elongated finger bones, Lwevshed pushed the buttons of the alien unit and watched its screen displace readout after readout until bringing into focus this one:

[California, 2573. Testimony of David Rhys Bradbrook, Immortal. Excerpted from his vanity-press autobiography.]

Yesterday, March 23, I visited my aunt, Gloria Bradbrook-Wisdom, for the first time in over seventy-five years. Aunt Gloria lives on an estate restored to our family soon after the Los Angeles Yuke [i.e., Eucomenopolis] was peaceably disassembled by its inhabitants.

Aunt Gloria has never married, preferring instead the company of her cats. Many of these resemble those sleek, haughty beasts that one can see depicted in ancient Egyptian statuary. I cannot say that I wholly understand my aunt's devotion to these aloof and slant-eyed animals.

When I arrived, the living room of Aunt Gloria's hacienda was acrawl with cats. They slept on sofa arms, draped themselves over ottomans, sat like procelain figurines near half-open doors, slunk along the marble baseboards with insidious suavity, and fouled the very air with their perfumes (applied) and their subtle catty stenches (natural).

Aunt Gloria was distant, abstracted, not herself.

"Another of them has died," she told me when I asked her what was wrong. "The 'droids buried the poor dear only an hour ago."

We went outside and strolled along the perimeter of Aunt Gloria's backyard garden, pausing at last between the holly trees on the edge of the Bradbrook-Wisdom Memorial Park.

This is a graveyard for cats. Their shrines rise in the foreground, recede into the hazy middle distance and pass out of view beyond the hillock delimiting my aunt's estate. Obelisks, headstones, statues of feline angels, ornate memorial litter boxes, and a labyrinth of catnip-lined paths.

"I get so attached to them," Aunt Gloria said. "I get so attached to them, and they're here so brief a time."

My heart not really in it, I comforted my paternal aunt as best I could....

—Cats? inquired Lwevshed's superior. —What are cats?

Lwevshed fixed a computer reconstruction of *Felis catus* on the console screen and relayed it via the standard

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Loshaibron psychic methods to her superior. At the same time, she understood something of Aunt Gloria's grief, more perhaps than had David Rhys Bradbrook. Even with Saturn afloat and beautifully bloated in one of the computer hall's observation ports, Lwevshed duplicated Aunt Gloria's sense of bereavement and felt the terrible intensity of its ache.

—This is not to the point, Lwevshed.

—Skip ahead?

—Yes, to the griefs occasioned by more serious bereavements. Cats, as we perceive the matter, are an irrelevancy: they were denied the treatments, it appears, and had no stake in their masters' pursuit of eternal life.

—You wish a readout addressing itself more rigorously to matters of *human* life and death?

—Please.

—From what period?

—Use your own discretion, Lwevshed, but jump ahead. Using her own discretion, she obeyed:

[Oslo, Stockholm, 2855. Excerpt from a literary review by Bengt Matsson in the Oslo-Stockholm Omnichron-Star.]

Life and Death *by Claude Hojier is a multivol in one hundred volumes totaling nearly thirty million words. The author composed this profound entertainment—considered by many his masterwork—between 2604 and 2789 during residences in most of the interdependent political sectors of Earth, several planetary metro-habitats, and all of the major satellite cities of our solar system's colonized moons.*

Purporting to be the life history of one of the first members of Homo sapiens immortalis, *one Adam Olamsson, this far-ranging work takes the reader from its protagonist's unpromising test-tube birth in 1997 to his unexpected death at the turn of the 26th century. When Olamsson's magnetoglider drops into the entrained plasma of Jupiter's outer atmosphere and then plunges irretrievably into an immense cyclonic methacane, the reader vicariously goes along for the same heart-stopping ride.*

Hojier is purposely ambiguous about Olamsson's death. Is it accident or suicide? The answer to this question is no doubt subtly embedded in the text of Hojier's rich and various centivol. Speculation is infinitely rewarding.

Life and Death *is now available in the Scandinavian Political Sector in a new computer translation from the original Franco-Jovian. (Hojier is now a naturalized citizen of Ganymede, incidentally, where he maintains a luxurious fourteen-room radiation bunker.) All one hundred volumes—in a microfiche carrier bound to resemble the ancient Gutenberg Bible—may be purchased for a single year's voluntary enslavement to the pansolar publishing company of Norstedt, Soner, Kronkvist, and Jones.*

In return, Life and Death *will provide almost a decade of exquisitely slow-paced reading.*

Your reviewer, for instance, recalls committing the entirety of his sep-

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tuagenarian adolescence to the leisurely perusal of Hojier's masterpiece; and even if such youth is now only a memory to you, I believe your mature delight will be comparable to my callow rapture.

I'm also pleased to report that Hojier is rumored to have just completed the twenty-second volume of his languidly awaited multivol-in-progress, From Here to Eternity....

As she relayed this item to her superior's vessel on Titan's surface, Lwevshed felt her own plasmic aura ballooning amorphously—as if she were Adam Olamsson and the storms of Jupiter were wrapping themselves about her in bands of reddish-brown gas. Instead, it was Saturn outside the computer hall's smoggy port, and she was a living Loshaibron wraith rather than a dead human adventurer.

—Much better, her superior told her. —Much, much better. Nevertheless, we are still at a remove from the daily anxieties of this contradictory species. An artifactual remove, one could say.

—I'm selecting at random. It's hard to—

—Undoubtedly. But try again. Jump ahead one more time, to a period when their extinction is both certain and immediate.

—I'll try.

Lwevshed eased a series of readouts onto the console screen, releasing each one only after she had attempted a cursory decipherment. At last she halted the information flow and obediently brought into focus a final item:

[Ptolemy Base, Luna, 2947. Excerpt from a recent essay on thanatology by Sharon-Davida Weng.]

The four most prominent causes of death among the pansolar populations of Homo sapiens immortalis *are 1) accident, 2) murder, 3) suicide,* and *4) psychological surrender to the syndrome now universally referred to as "immortalist grief."*

This fourth cause of final termination may soon surpass the others as prime destroyer, for with the assassination only sixteen E-weeks ago of Titan's beloved Lunarch, Selena Panmanterra, we have seen the extent to which "immortalist grief" may work its fatal havoc.

Panmanterra's assassin was a young man who discovered that in an utterly atavistic and hence deviant fashion his private genetic code doomed him to an early death. He was programmed at the molecular level for a pre-immortalist life span. Furthermore, for surgeons to attempt to correct the scrambled genetic messages at this basic level, the young man learned, would be to sabotage his very life and kill him that much sooner. Even immortalist wisdom, it seems, is not proof against the unpredictable happenstance of human error and the random anomalies of technological failure.

To err is human. Given this fact and

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the vastness of time, to malfunction is almost inevitable.

In any case, this young man, unable to cope with his biologically decreed death sentence and obsessively fixated on the status of Selena Panmanterra as the symbol of the immortalist community on Titan, resolved to take her life. He did so in an especially vivid and grisly way that spared neither of them. Except to record that the act was so heinous a violation of the immortalist ethic as to defy imagination, I will not describe his methods.

Perhaps it would please the assassin to know that in his savage bitterness and short-sighted self-pity he has taken many more lives than just one.

The thought that Selena Panmanterra will never—never—again give the benediction of her beauty and her intelligence to her constituency has proved an unacceptable psychological burden for many Titanites. If grief intensifies in direct proportion to one's perception of one's loss (as a researcher feels more keenly the accidental death of a pet cat than the expected demise of a laboratory animal), then many Titanites have perceived their loss as terrible indeed. The ghastliness of Panmanterra's execution helped shape this fatal perception; it undid the communal wisdom, giving her immortalist peers a glimpse of the primeval chaos they thought they had fled forever. The death's-head behind the youthful flesh has grinned at them, and they are appalled to find it still exists. It is almost as if the stability and wisdom imparted to them by long life and centuries of fruitful experience could not withstand a direct assault on their revered human symbol of these very qualities.

Panmanterra's consort of nearly two and a half centuries yielded to "immortalist grief" and took his own life.

Afterwards, the mechanisms of this grief have seemed to operate like some kind of lethal psychological virus—one to which we are all surprisingly susceptible precisely because our genetic codes predispose us physiologically to long life. The paradox is bizarre but demonstrable, and the intensity of the grief of Panmanterra's mourners has risen and continues to rise exponetially, expanding to influence more and more members of our species to follow the martyred Lunarch and her faithful consort down the shroud-draped way to extinction.

Fully one-third of Titan's inhabitants have gone into comas or trancelike paroxyms of self-directed violence. The means of restraint and treatment have been insufficient to prevent death in all but a few of these cases. The remainder of the population is severely incapacitated by the contagion of its ravening, intensifying grief. Art and commerce are at a standstill, and the disease dances outward from Titan in pavanes too fluid for corseting. Could it be that only on Panmanterra's Jovian moon conditions were right for the virus's incubation, and that only in the far and inward reaches of our solar system will

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the disease be able to burn itself out?

I am unable to say. I only know that as the grievers die they create more grievers. These in turn fail and pull others into the expanding web of "immortalist grief." The epidemic has since spread to several other satellites, with a number of cases having been reported as close to home as the citshells on Mars.

And I?

Well, I have begun to think again—after all these years—of the mysterious infant death of my only child in the merciless Himalayan winter of 2412....

Before her superior could cut in, Lwevshed arose from the console, withdrew from it her animating presence, and strolled in an eddy of shifting blue light to the air lock of the computer hall.

For a brief moment she was Viktor and Yevgeny Stavrin, Gloria Bradbrook-Wisdom and her unfeeling nephew, Claude Hojier and Adam Olamsson, Selena Panmanterra and Sharon-Davida Weng—all in the same encompassing alien shell. It hurt to be so intimate with them and with all the others whom their lives so exhaustingly implied.

Lwevshed went through the air lock and floated across a stretch of ice and frozen ammonia beneath an atmospheric pressure four times as great as that of Mars. Her skeleton reorganized itself on a denser, less avian model, and her aura flattened to accommodate the change. Under the yellow, cat's-eye immensity of Saturn she was a small, blue-glowing mist in a smog of sunlight-absorbing methane polymers. Night and cold enveloped her like persistent, inorganic rinds.

She was nothing. And, conscious of her smallness, everything.

The inhabitants of this system's third planet had found the secret of physical immortality and then trivialized in past belief. Until, perhaps, just before the end. At which point their—well, their somehow heightened humanity—had ironically contrived to undo them. Hence, the melancholy paradox of their having been *briefly* immortal.

Lwevshed convoluted in the air and beheld above her the veiled golden enigma of Saturn and its rings. Inwardly, too, she convoluted, knowing that the Loshaibron quest must end in no better than an ambiguous triumph. Like the latter-day immortals of this far-flung solar system, she, too, was ultimately doomed to die. The old creature anxiety weighted her like chains. However, several stars would form and perish before the instant of annihilation came upon her, in consequence of which fact her sympathy for her short-lived human counterparts burned in her feverishly. "Immortalist grief," she felt sure, was a mere playful pinch in comparison.

—Return to us, her superior commanded, breaking through the layers of her pain and anticipatory fear. —Return to us, Lwevshed.

After a time devoted to the night and cold, she obeyed. ■

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TIME'S WINDOW

Sometimes "optimum performance" isn't quite as desireable as it sounds.

BOB BUCKLEY

Adolph Brotman

Outside it was noon. The world was having lunch. The hearing room quieted as the bailiff escorted the judge through the massive antique doorway and then stepped aside to let her pass. He sat the bulky case of the Autosteno on the table next to the witness stand and hammered his staff against the hardwood floor.

"All rise, all rise. The Honorable Judge Robin Fechik is now presiding over this inquest into the death of Sir Innes Aaby, Fellow of the British Museum, and honored Knight of His Majesty's Realm."

The judge, a woman, mounted the bench at a measured pace. She was young for her position, and her dark robes could not conceal her quiet beauty. But there with the beauty was something which might be described as a tranquil wisdom, a hint of maturity beyond her years.

That was well. The case before her court might try that wisdom to the limit before all the facts were heard and a verdict rendered. The fatal incident was without precedent, and already the press and video services were making a field day out of the cover-

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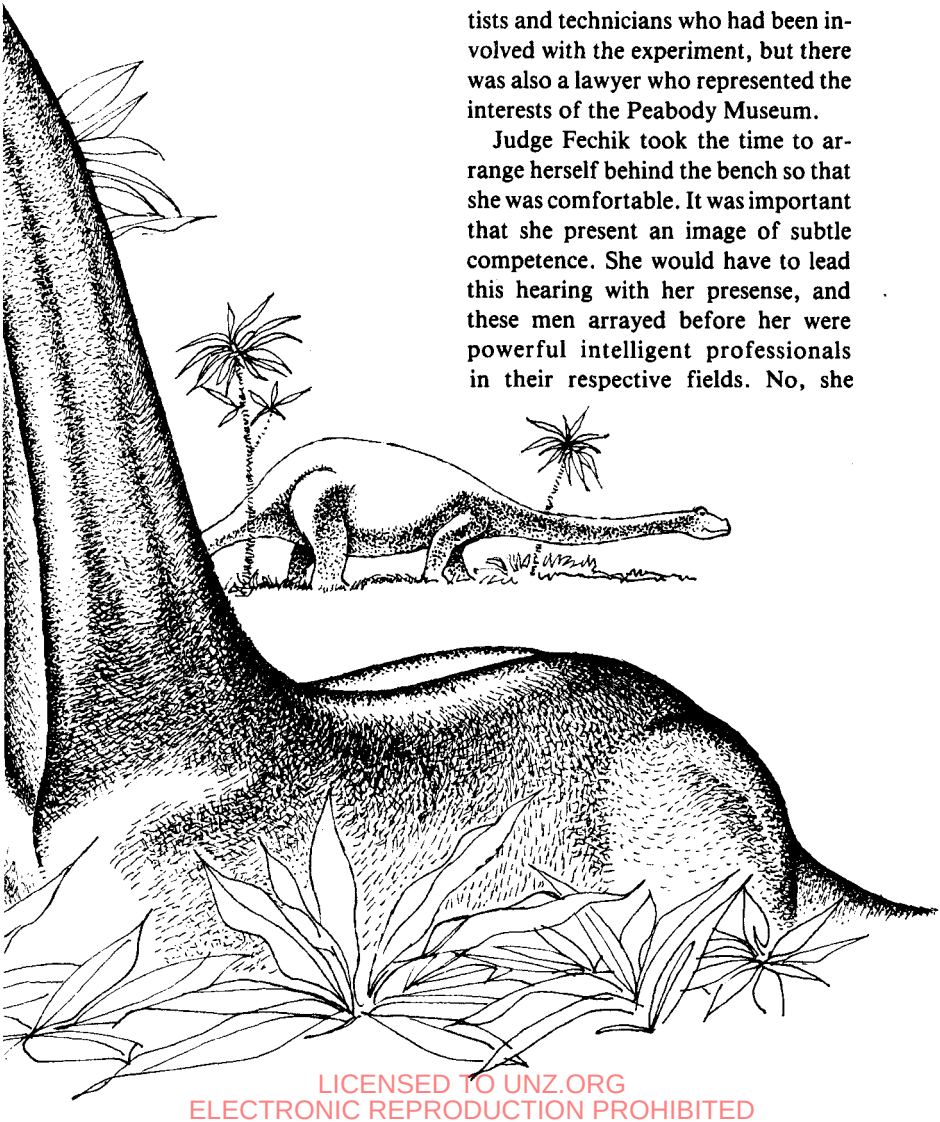
age. Perhaps it was for that reason that only one representative of the press had been allowed inside. He resided in lonely vigil behind a glassed-in alcove that intruded into a corner of the hearing room.

The witnesses were arranged before the bench in a semicircle of low wooden tables. These were the scientists and technicians who had been involved with the experiment, but there was also a lawyer who represented the interests of the Peabody Museum.

Judge Fechik took the time to arrange herself behind the bench so that she was comfortable. It was important that she present an image of subtle competence. She would have to lead this hearing with her presense, and these men arrayed before her were powerful intelligent professionals in their respective fields. No, she



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couldn't allow any slips. A loss of control would be disastrous.

She nodded at last to the bailiff and rapped for attention.

"Please be seated, gentlemen. This hearing into the death of Sir Innes Aaby is now opened. We will begin with the playing of the Coroner's report."

The bailiff had anticipated her and was prepared. He triggered the recorder. A dry, dull-toned voice began to issue from the speaker.

"August 3rd, 1997. The following is a verbal summary of the written report of Walter Richmond, City Coroner, Denver Colorado on the death of Innes Harold Aaby, male Caucasian, age 58, henceforth referred to as the subject.

"After completing the specified external examination and performing an upper-torso dissection I have concluded that the subject expired within minutes of receiving a severe traumatic injury to the frontal portion of the cranium, and a deep and ragged laceration of his neck which severed the carotid artery and destroyed portions of the esophagus and trachea. Causes of death were various considering the nature of the injuries, but the most immediate was a rapid loss of blood.

"As for the causal agent of these injuries, it appears that the subject was attacked by a very large animal having blunt teeth and strong jaws. Most puzzling though, is the fact that the tooth marks are unlike those of any living animal. Because of this, the assumption that the death was due to foul play and disguised to appear as an attack by a large animal should not be discounted at this time.

"This concludes my report."

The recorder stopped. The hearing room remained unnaturally quiet. Judge Fechik studied the many faces arrayed before her. None were turned to hers.

She consulted the seating chart before her, an addition of the bailiff who knew her requirements and whose cleverness greatly expedited her sitting on a case.

She started at her left.

The lawyer Metcalf was new to her. He was not a native, but had flown from New York on that morning. His purposes for being present were not completely known. She suspected that his interests included more than just the welfare of the Peabody Museum.

Sitting next to the lawyer was a young, tanned fellow with close-cropped blonde hair. He wore a sun-faded sports outfit and was the only witness, apart from the lawyer, who did not seem to be nervous. His name was Peter Giddings.

She filed that observation away for future reference.

Next to Giddings sat Kenneth Gluckman, the inventor of the device identified in the data sheet as a temporal scanner. He was bald, in his fifties, and if a face had ever said, "I'm guilty," his was it.

Why was he so jittery? the judge wondered to herself, and let her eyes roam to the next table and its occupants.

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Nathan Roth was no stranger to her. He was the court's advisor and a well known and respected paleontologist. It was Roth who had documented and published the *Oligocene plesiosaurus* find in Mexico and shown that this dinosaur-age creature had survived well into the Age of Mammals before becoming extinct, as had the *Ichthyosaurs.* That one fossil find had made his reputation, and she had been fortunate to get him here on such short notice. She suspected that he would have come in any case merely to find out for himself just what the mysterious Gluckman had discovered.

Burnham Stokes filled the last seat in the line of tables. His gray suit was conservatively cut, and rather old-fashioned. He also affected an empty pipe which he constantly fumbled about in his hands, either polishing the wood with his thumb, or rubbing the satiny bowl against the flat of his hand. He almost never placed the well-used, but unfilled and unlit pipe into his mouth.

After Sir Aaby, Stokes had been the chief paleontologist with the research project. And he seemed almost as nervous as Gluckman.

The judge ran the tip of her pencil up the list thoughtfully. It stopped atop Gidding's name.

She leaned back in her tall chair and assumed a businesslike demeanor.

"The court calls Mr. Peter Giddings to the stand."

She waited impatiently as the bailiff swore the witness in and went through the other preliminaries. When it was all done, she stared intently at the young man, forcefully telling herself to remember that just because he might be handsome he might also be a liar. . .or even a murderer.

"You were employed as Dr. Gluckman's assistant on the Aaby project?"

"I was Your Honor."

"Would you explain for the court in your own words your duties and the nature of this project?"

Giddings took a deep breath and glanced once at Gluckman cautiously before beginning.

"I'm an electronics specialist. I operate the temporal scanner, maintain the mobile van, and keep the various support devices in repair.

"The Time-Scan Project which Sir Innes headed grew out of Dr. Gluckman's invention of the scanner equipment and its mobile platform. I was Dr. Gluckman's assistant when he first developed the device and when we were funded for field operations he asked me to stay on. The heart of the project is the van which contains the scanner equipment. On its roof is a microwave antenna which receives beamed power. The scanner requires a tremendous amount of electricity to operate."

"Why microwave power?" Judge Fechik asked quietly.

She knew already, but this was one of her methods of testing a witness to determine his knowledge and degree of frankness.

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"Because Ken wanted mobility to be a prime characteristic of the scanner and it just isn't possible to store the power consumed hourly by the device in conventional fuel-cells or batteries. Because the van must work in rugged areas far from power lines it is equally impractical to 'pipe' in electricity by cable, so we have an arrangement with the POWERSAT Corporation to beam us down as much power as we need. There's a computerized range-finder keyed to the roof antenna which keeps us locked to the satellite's transmitter."

"I understand. When did Sir Innes take an interest in Dr. Gluckman's invention?"

"He learned of the scanner through Ken's paper, which was published in *Nature*. I suppose that he realized the potential of the device and urged his museum to come up with a grant. That was our project: to produce a temporal and ethological investigation of sauropods inhabiting the middle and late periods of the Mesozoic Era."

"And what might a sauropod be?"

"Well, Bernie Stokes could give you a better description than I, that's his field. You see, they're dinosaurs, ungodly big ones, built something like a cross between a huge lizard, an elephant, and a giraffe. They're the biggest things living, short of the blue whale. Were, I guess I should say, since they're all dead, now. It's difficult to describe them using only words. . .like telling a blind man about flowers if he's never seen any. But we did see sauropods through the scanning plate of the device. We moved the van around from site to site and filmed whatever showed up on the screen. We were studying three genera of sauropods before Sir Innes was killed: *Diplocids, Brontosaurs,* and *Brachiosaurs.* We mainly stayed at the sites of major fossil finds, but we also used the scanner whenever we found anything interesting."

"It must have been fascinating," Judge Fechik remarked.

Then she remembered her position and frowned.

"Very good, Mr. Giddings. I believe we should hear from Mr. Stokes, now."

The transition of one man departing the witness stand and the other taking his place required a few minutes. Judge Fechik used these moments to make notes on the testimony she had just heard.

When the bailiff was finished with Stokes she looked over at him.

"Would you please describe your associates for the court?"

Stokes seemed caught by surprise. He blushed slightly.

"I thought you wanted to hear about dinosaurs?"

"The court will hear of that matter, too. But at this moment I want your opinions on your co-workers. How long had you know Sir Innes?"

"Almost a year. A very knowledgeable person, but a real dictator. He insisted on running the show, selected all the viewing sites himself. Seemed to think the scanner was his personal toy."

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"Did you resent that?"

Stokes hesitated, looking around the room warily.

"Probably. . .hell, of course I did. He was arrogant and rude to almost everybody. We spent more time fighting about what we were going to observe than actually looking at the scanner. That was stupid in my opinion."

"And how did Dr. Gluckman get along with Sir Innes?"

"Badly. Only young Peter seemed on good terms with Aaby. Innes treated Peter as if he were his graduate student, always pointing out little details to him while they were viewing, and they did that a lot together. The viewing chamber of the scanner is quite cramped, just room for two people inside: an operator and the observer. Aaby wanted that changed, wanted the chamber larger. Ken explained again and again that it was impossible, that the scanner was constructed along certain physical principles and that they could not be manipulated to suit his whims.

"That didn't sit well with Aaby. Nothing Gluckman did to improve the device seemed to satisfy Innes. He was always complaining about the definition of the image on the screen, and the limited depth of field. In Ken's defense, he was trying to improve both, but it was difficult. It took him a long time to find the answer and he decided to be cautious about letting Aaby know too soon. Ken hated to be made sport of, and Sir Innes was a vicious kidder."

"Thank you, Dr. Stokes. If you will stand down we will hear from Dr. Roth on the merits of the Project's studies."

Stokes seemed reluctant to allow that. But he did not protest and moved off the podium for the other man.

With Roth on the stand Judge Fechik began to feel more secure. She knew that the paleontologist was a friend of the court.

"In your function as a technical expert, have you studied the rough paper prepared by Sir Innes Aaby and Dr. Burnham Stokes?"

"I have your Honor."

"How did you find it?"

"Fascinating. A genuine work of genius on the parts of the project members. It is a tragedy that Sir Innes is not here to share in the fame that will surely belong to all of the group once the work is published."

"Would you briefly describe the paper?"

"Certainly." Roth leaned back and collected his thoughts.

"As you have heard previously, the aim of the project was to document the ecology and ethology of the sauropods. This was accomplished by driving the scanner to the site of a sauropod fossil find and using a fragment of the fossilized sediments of the bedding plane to key the visual reception. Sorting out the desired image from the confusion of multiple readings is said to be the most difficult part of the procedure. I do not pretend to understand the physics or technique involved to do this, I only know that it

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works, and so I would look foolish at this advanced stage of Ken Gluckman's research to scoff and say such a thing is impossible.

"The first viewing site to be documented was near Glen Rose, Texas, where sauropod tracks were discovered in the early 1900s. The film I viewed showed a jungle river, slow moving and quite muddy meandering between shallow banks. There were sandbars near the north shore and several dinosaurs were basking there. They appeared to be young sauropods, but in truth I was unable to identify them.

"The real star of the footage was a solitary *Brachiosaurus* who was moving slowly up the river with just the upper portion of his back and his head with two or three feet of neck showing above the brown, turbid water. He wasn't swimming, we know that from his tracks which were preserved and later exposed millions of years later. What he is doing is walking along the bottom with his forefeet. His hindlimbs are drifting, as is his tail. After moving some yards down the river he spots what must be a tempting food reserve for he suddenly changes direction and wades ashore, a veritable mountain of flesh, his smooth hide running with water and mud. For many years these beasts were considered to be completely aquatic. This study proves conclusively that they were not, however. No more than the elephants and hippos of today. The giant herbivores seemed to use rivers and ponds as drinking and bathing areas, and sometimes as highways, since breaking down forest is no easy task even if you do weigh 25,000 kilograms.

"The second viewing site was possibly the best and most productive of the entire investigation. It took place in the area where the vast Morrison formation is found.

"The Morrison environment was one of deep forest broken by shallow streams and rivers, which sometimes collected into temporary lakes. This was a flood plain draining much of the western continental platform off into the Sundance sea, and although rainfall was sometimes sparse, the many streams and rivers flowing through the area kept the forests well-watered.

"The forests themselves were extraordinary. The Mesozoic was the culmination of the rule of conifers and cycads. Magnolias, ginkgoes, and thick clusters of several varieties of cycads punctuated what was predominantly a climax forest of cypress and pines. The upper canopy of the forest reared over everything like a green cloud hovering a hundred and seventy-five feet in the air. Swaying cycad fronds made a less dense canopy at a lower level, and at the ground level, fern thickets covered the moist, litter covered ground. Seeing this vast, virgin forest it is easy to understand why having a long neck was such an advantage to the sauropods. The great beasts moved in loose herds through the shadowy cathedrals of immense trees, tearing boughs from the upper reaches and swallowing them whole.

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A stone filled gizzard 'masticated' the green roughage into a vegetable paste that was eventually digested by multiple stomachs containing symbiotic bacteria and protozoans. When a food tree had been stripped it was sometimes pushed over so that the remaining foliage could be devoured. These herds tended to break 'highways' through the forest tracts leaving jumbled and broken trunks behind in their wake. Breeding went on year round and the eggs were laid among the heaps of leafy refuse and kept warm by rotting compost. When the young hatched they immediately began to feed on ferns and the seedlings which by that time had began to sprout through the devastation. These yearlings kept to themselves, leading a solitary existance until their third year when they were large enough to mingle with the giant adults and not be trampled underfoot.

"All of the sauropods appeared to be virtually defenseless when viewed as articulated fossil skeltons. But dead bones lack behaviors, and Sir Innes realized that the sauropods might not have been as fragile as they seemed.

"Alone, separated from the herd which provided their single greatest weapon against predation, they certainly were defenseless. One film I viewed showed one such isolated straggler being harried and finally destroyed by a pair of *Allosaur*. The backbone of this unfortunate *Apatosaurus* today graces the halls of the American Museum of Natural History, complete with the toothmarks of its killers.

"None of the giants, whether herbivore or carnivore, was particularly intelligent. They functioned primarily through instinct. Learning played little part in shaping their behavior patterns. But since their environment changed little through millions of years, and there was no 'intelligent' competition such as large mammals, possessing instincts alone was no handicap. Learning is a tool which allows adaptation to a rapidly changing environment. The dinosaurs did not require it. However, if only a few HAD possessed this trait there might still be some of these beasts surviving today."

Roth flushed suddenly and bowed his head in embarrassment.

"It appears that I have wandered rather far afield. Still, I feel a discussion of the work of the project is necessary so that this inquiry will be able to understand the motivations and actions of the participants."

"The court is not bored," Judge Fechik assured the paleontologist. "Please continue. I wish to hear of the extent of Aaby's investigation. You were describing the defense of the sauropods."

"Yes. Well, it was remarkably simple. All of the giants possessed excellent vision. The typical response to the appearance of a predator was panic. Fear spread rapidly through the entire herd and a stampede began. Can you imagine what it would be like to discover over a hundred animals each with the mass of at least ten elephants thundering ponderously

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down upon you? There would be no question of pressing home an attack against such odds. The only response could be to flee or die, smashed into the soft ground by countless huge feet working like pile drivers. Sir Innes filmed one such episode as a *Tyran-Parrosaur* in what today is the state of parrosaur in what today is the state of Maryland."

"That occurred at the third viewing site. The last viewing, the one which took Sir Aaby's life, took place in the Dry Mesa bone quarry of Colorado. Some of you may remember that this was where the giant species of *Brachiosaur 'Supersaurus'* was disinterred. These beasts were the greatest of all land animals, their heads rising fully sixty feet above the forest floor. Once they reached a certain age and mass nothing could touch them except for starvation or disease, although some did perish in fast running streams after sudden downpours. That was how this particular individual died.

"Sir Innes was said to be particularly taken with this animal and insisted that his crew traverse the scanner back in time so as to follow the beast backward along its fatal journey. It was there in that primeval forest amid the gloom of a dense, overhanging canopy of dawn redwoods that Sir Innes Aaby met his own end.

"I could describe how that happened, but I feel one of the others would be more qualified to explain the occurance as he was actually there."

"Very well," Judge Fechik made a swift notation on the paper before her. "You are dismissed, Dr. Roth. The Court calls Kenneth Gluckman to the stand."

Judge Fechik watched the inventor approach the podium reluctantly and climb onto the raised seat.

As the questioning proceded, Gluckman began to describe his invention: the temporal scanner.

"It's not a simple principle. It may be that we don't fully understand it even now. At first I believed that the device freed isotobes entrapped within the atomic structure of the fossil sediments and that what we were seeing was merely a resurrection of light which had been stored within the stone, something like the energy released from coal by the act of burning. In the beginning it seemed a reasonable theory. However, the events of the last few weeks have cast its basic premise into grave disarray. There's no way that an image created out of photonic energy could have produced the phenomenon that caused Sir Aaby's death."

Gluckman continued in great detail, explaining how he had produced a small working model of the scanner and observed a battle being fought in Virginia during the Civil War. That scene had been generated from a portion of mudstone dug from the bank of a long-dry stream. He was quite naturally excited and his next device was constructed to be more powerful. But he found that he could not control the fine tuning of the multiple images and the result on the screen was a

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kaleidoscope mixture of wavering colors which could not be separated. His first success was not duplicated until he had paired the device with a scanning computer and written a program to filter out the various strata of images. After that innovation the temporal seanner had become a genuine tool and not merely a scientific parlor trick.

So much for the history. There had been a lot of that so far, Judge Fechik realized. She interrupted the flow of talk to ask a leading question about the central character of the inquiry.

"What of your relationship with Sir Innes? Did you get along?"

"Of course not." Apparently Gluckman was not one to mince words. "The man was a politician, a gamester of science. All he understood about my device was that it had great potential as a 'movie-maker.' He saw it as show business, and the last straw was his childish attachment to that great, blundering beast that was dug out of the rock at Dry Mesa quarry back in '78.

"Its only talent was eating. All day long and most of the night, chomp, chomp, chomp, denuding a square mile of forest every two days, that's what a herd of the beasts could do when they set their pea-sized brains to the job at hand."

"Then I would assume that your goals for the scanner differed from those of Sir Innes Aaby."

"They did, indeed, your Honor. They did indeed. But I didn't kill the poor fool. . .he managed to do that all by himself. It was his infernal curiosity that did it. No one forced him to fool around with the scanner, he had a trained operator for that. But he was always complaining about the definition of the image. 'No depth of field,' he would gripe. Or 'the foreground is too fuzzy, can't you fix it, Gluckman.' I heard that song for most of a month."

"What did you do about it?"

"Just what I had been trying to do all along. . .improve the design. And I did. All that was needed was a heavier power amplifier and another network of filter circuits. After POWERSAT doubled their output to us I managed to improve the image a hundredfold. Tested it late on the evening before Peter and Sir Innes went out on a run. Worked like a charm, but I didn't have the time to check out the secondary effects that the improvement might produce, I was too tired, just wanted to see my bunk. Left a note warning Peter to use the scanner in the low-power mode. When I woke up the next morning they had already driven the van off to Dry Mesa."

Gluckman paused and gulped a deep breath. Judge Fechik noticed that his hands were trembling on the railing of the witness stand. His eyes, anguished now, searched out her own.

"You must understand that I couldn't have wished what happened to Sir Innes on anyone. I'm just surprised that Peter is still sane. . .he's the one who witnessed everything. It all happened right in his lap, poor lad."

It was at this point that the lawyer

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for Peabody requested permission to question the witness. Judge Fechik agreed. The lawyer wanted mainly to know about the current disposition of the scanner. Gluckman seemed to answer the man honestly.

If Gluckman was guilty of murder he was a superb actor in his own defense.

Finally, Judge Fechik called Peter Giddings to the stand for a second time. The inquiry preliminaries had been dispensed with. It was time to determine the facts surrounding the fatal incident. As she twirled a pencil nervously through her fingers and watched the young man approach the stand she found that she was looking forward to his testimony with some trepidation.

Just what had happened inside the darkened, cramped interior of the mobile laboratory on that chilly Colorado morning? Did she really want to know?

But no, a man had lost his life, and it was up to her to measure and affix blame, if there was any cause of blame. Reluctantly, she faced Giddings.

"Would you please relate for the Court the events of the morning of May 29th, 1997?"

"Certainly, your Honor." Giddings returned her gaze seriously. He at least was calm, or at least he seemed that way on the surface.

"That was the morning that Sir Innes and myself took the van up to Dry Mesa quarry. There was a sizeable dig up there in the seventies and eighties. They located the first and only specimen of *'Supersaurus'* there. Sir Innes wanted to film the beast as it had appeard when alive.

"We parked the van on level ground next to the old, abandoned excavations and while I powered up the scanner, Sir Innes took rock samples from the matrix where the bones had been extracted. Together we processed them and fed the material into the laser scanning receptacle.

"The first image we got was that of looking up from the bottom of a clear, but very turbulent stream. I rotated the scan and elevated the point of focus until we were hovering just above the far bank, looking out across the water.

"Our subject dinosaur was already dead, its corpse caught between two boulders in midstream. The tail was shredded, as was the head and most of the neck. The current was very swift and powerful, and tearing the carcass apart before our very eyes.

"Sir Innes had me reverse the flow of the scan and speed up the sequencing of the images. That's like running a movie in reverse. At once the body broke free of the rocks and with a shuddery motion slid up the stream with the reversed flood. I followed, spinning the traverse controls on the console to keep it on the screen.

"If you've never seen the van, the scanner plate is like a picture window, circular and three feet across.

"It wasn't long before we reached the spot where the huge *Brachiosaur* had first toppled into the water and drowned. There was a jungle trail

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coming out of the forest and the herd had been crossing the stream. It was raining. There was a thunderstorm back in the hills that rose some distance beyond the forest, we could see the clouds boiling on the horizon even though the definition was very fuzzy. The lightning was pretty fierce. That must have been what had spooked the giants because we never spotted a carnosaur the entire time that we were viewing.

"It was the fast water that did the beast in. The current pulled it off its feet. Once it started falling everything went down just like a toppling mountain. The whiplash as its neck hit the water must have broken the spinal cord. The animal never got up, or even tried to, just let the water carry it off in a jerky rush."

Judge Fechik broke in. "What was Sir Aaby's reaction to the death?"

"He seemed excited. Told me to backtrack the herd, and I did. We followed them about a mile into the forest, that's where they had been feeding when the storm had frightened them. The trees were very thick, mostly redwoods, and very tall. I guess that's why the *Brachiosaurs* had such long necks, to exploit a food supply that shorter dinosaurs couldn't reach. There was a lot of fodder hanging on those branches and they especially seemed to enjoy the green cones. Whenever they came across one they would yank it free and swallow it.

"Our animal was feeding with the others, and Sir Innes had me bring the scanner screen right up to the beast's face. I got some super closeups of the thing chewing and swallowing. Reminded me of a living machine because of its deadpan expression. Had a face with all the expressiveness of a trashmasher even though the nostrils on the top of its head were elevated and twitched a lot, probably to keep the pin needles out of its nose. The eyes reminded me of a cow's, but they were the size of tennis balls. At times, they seemed to be looking right at us."

"Wasn't Sir Innes nervous about being so close to the creature?"

"Oh no," Giddings grimaced, as if a terrible memory had surfaced suddenly in his mind. "All we were seeing was a picture, like a nature show on the Holo at home. Of course the picture was pretty fuzzy, foggy and blurred. That griped Sir Innes. He complained about it pretty loudly. He was so upset that I mentioned Ken's field change. Well, right then he wanted me to show it to him. I told him no, having read Ken's note. But Sir Innes insisted, so I showed him the modified controls.

"By that time the *Brachiosaurus* was facing the screen snatching another pine cone.

"I realized that I had made a mistake as soon as I pointed at the mode control lever. Sir Innes pushed my hand out of the way and yanked it down. Almost at once the image on the screen cleared to a remarkable degree. Then a clap of thunder made me jump clean out of my seat. There

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was water coming in through the screen and splattering all over the floor and front console. I could hear birds squawking and smell the piney scent of the big trees, the wetness of the rain, and a ripe, sweaty odor like what you'd run into around the rhino cage at a zoo. A warm, humid wind filled the interior of the van with a curtain of rain as I crouched down on the wet floor. Sir Innes seemed to be in a trance as he stared out at the huge face of the *Brachiosaurus*...eye to eye, they were.

"The beast swallowed the cone it had been chewing and I watched as the lump began to slide down its immense neck. Then, without warning it darted forward and grabbed Sir Innes in its mouth. I heard a muffled scream and...."

There was a long silence.

"And what?" Judge Fechik urged, fascinated in spite of her horror.

"And I passed out. When I came to I was lying in a puddle on the floor. The rain had shorted out the scanner console. It was sputtering sparks and the image on the screen was shifting and fading like the reception on a badly tuned Holo. Sir Innes was dead, slumped across the panel in front of him. There was a lot of blood. At first I didn't know what to do."

There was another long pause as Giddings collected his thoughts. He seemed shakened for the first time during the inquiry.

"He was a friend," Giddings continued finally. "No one else in the Project was particularly fond of him, but no one killed Sir Innes on purpose. The *Brachiosaurus* must have mistakened his head for another pine cone...we were up in the tree tops and the screen was at that time a window into both worlds. The big dinosaurs just weren't too bright."

"Indeed," the lawyer from the Peabody Museum agreed in a low voice.

He stood up, facing the bench.

The reporter sheltered in his glass-fronted cubicle was speaking excitedly into his mike. The verdict, at least for the populace, had already been rendered.

"Your Honor," the lawyer said with controlled presence. "I doubt that my institute will place any blame on the members of the Project for the death of Sir Innes Aaby. I move that this inquest declare the unfortunate incident to be death by misadventure."

"Your motion is well taken, counselor."

Judge Fechik studied the others in the room. She could detect no vast displays of relief, only a grim, almost brooding silence.

"The Court so finds and clears all parties of any responsibility in the death. The guilty party itself seems to have perished shortly after perpetrating the murder anyway. I now declare this inquiry closed."

Her gavel rapped loudly three times on the wooden block and abruptly the Sir Innes Aaby affair was history.

Later, changing in her chambers, Fechik received a visitor. It was Peter Giddings.

He glanced around his surround-

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BIOLOG

by Jay Kay Klein

Legend has it that one young housepainter earlier this century failed to secure entrance to art school and went on instead to a political career of sorts. However Evan TenBroeck Steadman, a young housepainter born in Northampton, Mass. and raised in northern New Jersey, studied printmaking at the University of Denver and illustration at the Parsons School of Design, eventually becoming a frequent illustrator for Analog.

Broeck ("Brook") actually had sold his first Analog illustration for Phyllis Eisenstein's short story "Lost and Found" in the October, 1978 issue. He had already been working as a full-time commercial artist with commissions for children's magazines, the Saturday Review, and advertising agencies. Since then, he has also illustrated several paperbacks. Andre Norton's Zarsthor's Bane (ACE Books) has over fifty of Broeck's drawings.

He was originally thinking of becoming a marine biologist, until one day he drew a picture of a strange blue man on a distant planet and knew he would rather be an artist. Last year he had two one-man shows, selling pieces at both exhibits. In this same year he became a certified scuba diver, enabling him to pursue as a hobby what originally he had thought of as a possible profession.

Science fiction first attracted Broeck's attention at the age of seven, when he was half-frightened to death by a movie based on John Campbell Astounding story, "The Thing from Outer Space." In the fourth grade he read Wells' "Time Machine" and became a regular science fiction reader. And of course as a recent product of forces and events science fictional, he was a devoted Star Trek viewer.

This background stood him in good stead when an ad agency had the artist develop on behalf of d-Con ant and roach spray a TV character half-way between Darth Vader and C3PO who beamed in from space to save the distressed housewife. In private life, it's spiders that especially fascinate Broeck. At one point he had more than 300 in his apartment in New York City, including black widows. And if you should step into Broeck's parlor on West End Avenue, you would meet his current chief pets, two tarantulas.

Broeck Steadman

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ings uncertainly as he entered.

"Nothing to be nervous about, Peter. This is a social call."

"Oh." Giddings relaxed somewhat. But he was plainly unused to the company of judges, male or female.

Robin found herself running the conversation.

"Are you going to continue your work with the scanner? It would be a terrible waste to abandon such a useful window on the past."

"Ken will go on with it. I guess I'll help too, now that we know what to be careful of. This will probably be the start of quite an adventure. It's a shame that Sir Innes won't be around to enjoy it. He would have loved actually being able to touch the past. Ken wants to discover if we can safely send physical objects through the window."

"I shouldn't think there would be any doubt of that by now."

Robin unzipped the flowing black robes and stepped out of them. She was wearing a clinging blue pants suit beneath her mantle of office. She also noticed that Gidding's gaze was definitely more interested now.

"I'd like to hear more about the scanner and the Project. Would you care for some dinner? I'm a passable cook, at times, anyway."

Giddings grinned.

"I happen to be in a gambling mood. My car?"

"Why not?" The judge moved to fetch herself a coat. "By the way, my name's Robin."

Later, as they drove along a forested country road with a light rain misting the windshield of the tiny speedster, Robin wrestled with a tangled thought.

"Once," she said to Peter, "the legal profession debated whether or not it was proper to punish a criminal before he actually committed a crime. The answer was cut and dried, then. But this temporal scanner has placed an entirely new dimension on the problem. Your murderer died 100 million years before Sir Innes was born. I wonder what those ancient pundits would have thought of that?"

Giddings shrugged as he steered the car through a wet curve, letting the rear wheels swing out just enough to be exciting.

"It wasn't really murder," he reminded her. "Humanity murders, animals kill for food. Still, perhaps justice is more universal than we think. In this case the scales were balanced long before we could act. Time's window shines both ways."

"It did this time," Robin agreed.

She considered quietly for a moment, then touched Peter's shoulder.

He glanced over at her.

"How many windows do you think are around us at this moment?"

He looked away without answering. But his smile had turned into a thoughtful frown.

Just how many windows would they encounter now that the past was opened? And who might be observing them? Whose past were they?

She found it an uncomfortable thought.■

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the alternate view

BIO CYBER NETICS II

by G. Harry Stine

You've probably never used a neurophone, but some people have

Last time around, two issues ago, I reported on the progress made by DARPA (Defense Advanced Research Projects Agency) concerning computer recognition of human EEG patterns. I stated that this was a major breakthrough in the development of the true intelligence amplifier wherein the human nervous system was linked directly with the electronic circuitry of a large general-purpose computer. Soon, the crystalline circuitry of the computer will be able to "understand" the colloidal circuitry of the human nervous system by direct linkage through electromagnetic fields.

And I left you hanging by your fingernails on a figurative cliff overhanging an ammonia sea swarming with methane monsters, so to speak.

I stated that *seventeen years ago* the breakthrough had been made that would permit the colloidal circuitry of the nervous system to "understand" the crystalline circuitry of the electronic computer. In other words, if the computer signal was in the proper form, the human nervous system could pick up and decipher the electronic computer signal through an electromagnetic field.

In early 1962, I was working as assistant director of research for the Huyck Corporation in Milford, Connecticut. Dr. William O. Davis was the director of research, and he had been charged by the company to look for new products to insure that Huyck would be in business twenty-five years hence. There were no caveats placed on us *at that time.* We could look at or for anything. . . and we did. Then as now,

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I have all sorts of pipelines into the back rooms of various research and development organizations here and abroad; a science fact or science fiction writer really can't function properly without these contacts. My most valuable Little Black Spy was the former editor of this magazine, John W. Campbell, who in turn had an incredible network of Little Black Spies.

Campbell told me about an 18-year-old boy in Texas who had invented a spectacular new hearing aid. I made a telephone call, talked to the boy, and was on the plane to Houston within days.

G. Patrick Flanagan of Bellaire, Texas was a boy genius. In addition to being an outstanding gymnast and a pilot, this high school graduate had stumbled upon a technique of introducing audio information directly into the human nervous system without loudspeakers or earphones, and without a direct electrical connection between his gadget and the nervous system.

On July 24, 1962 in Bellaire, Texas in Flanagan's shop in the attic of his parent's home, I personally witnessed proof-of-principle demonstration of a direct linkage between a crystalline electronic circuit and the colloidal system of the human nervous system.

The device, called the "neurophone" by Flanagan, was a very simple gadget. It used those ancient devices known as vacuum tubes. It used a 6L6G tube running as a 35 kilohertz oscillator; the output of the oscillator was amplitude-modulated by the output of any single-channel hi-fi system through suitable impedance-matching transformers, etc. This amplitude-modulated 35-kilohertz signal then went through a cheapie step-up transformer so that the output was very high voltage (about 4 kilovolts, as I remember) but at very high impedance. Flanagan fed this signal through a length of ordinary TV antenna twin-lead to a pair of rubber pads about six inches in diameter that he had filched from a "relaxicisor" muscle relaxing device. Each pad consisted of a 1/16-inch-thick rubber sheet, a piece of copper window screen to which was soldered one of the wires of the twin-lead, and the rubber covering of the relaxicisor pad. The rubber insulation kept one from getting zapped, although the shock wasn't painful...just annoying.

Put a signal into the neurophone input, peak the frequency, peak the modulation to 100%, and then hold the two pads to your body...anywhere.

And you heard the music playing in your head!

Although the pads worked better and you got a louder signal with the pads on your bare skin, it would work through a layer of clothing.

And it would work regardless of where you put the two pads! You could put one on your shoulder and the other on the sole of your foot... and you would still hear whatever program material was being played into the neurophone from the hi-fi system.

I can freely describe this today

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because (a) I don't think Flanagan's patent application ever got accepted and I don't believe the patent ever issued, (b) Huyck Corporation is off doing its classic thing of making paper machine parts and isn't interested in the slightest, and (c) I think the time is just about right to get going on this little gadget again.

Flanagan had succeeded where others had failed. Dr. Henry Puharich had succeeded in developing a similar device, but the pads were one-inch copper plates that had to be rubbed along the skin to achieve the "fricative effect" to permit Puharich's gadget to work.

In a series of long and complex experiments conducted under my supervision at Huyck and by Dr. Wayne Batteau at Tufts, it was conclusively shown that the neurophone effect was not the result of (a) the pads acting as electrostatic loudspeakers, (b) the pads exciting bone conduction of the sound, or (c) the pads activating the Eighth Cranial Nerve. Although I tried the neurophone on a nerve-deaf medical doctor at Columbia University in 1965, I kept the experiment running for only about ten minutes. Dr. Wayne Batteau tried it at Tufts and succeeded because the brain of his nerve-deaf subject had "forgotten how to hear," and needed something over an hour of application of the neurophone signal in order to begin to hear in his brain again! We know now that the Flanagan neurophone operated by direct linkage of the electronic circuitry with the nervous system through electromagnetic fields. We know now that the nervous system will pick up any signal and send it to the brain where the brain recognizes the signal according to the sensory data it represents, then switches the signal to the proper sector of the brain responsible for processing such signals. But we don't know how Flanagan accidentally happened to crack the neural code for audio data.

I can assure you that the Flanagan neurophone was and is no hoax. Many responsible people experienced it. Just before his death, Dr. William O. Davis gave me one of the neurophones we had built at Huyck; I still have it, but a two-hour search through my uncatalogued archives of scientific memorabilia and trivia failed to locate it this morning. I'm going to dig it out and try it again for fun. And because it does represent a breakthrough that will permit electronic computers to communicate directly to our nervous systems... by putting on a beanie, and *not* by plugging a cable into a socket implanted on the top of our heads!

The DARPA work with computers deciphering human EEG signals, plus the Flanagan neurophone capable of permitting a computer to communicate directly with a human, both make inevitable the final computer; the use of the electronic computer as an extension to the human brain as an "intelligence amplifier" for the human being.

Now, what happened with the Flanagan neurophone, and why haven't you heard more about it? I am not

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sure that it is because of the reaction of Big Science as discussed by Jerry Pournelle last month. There were several factors involved.

First of all, it didn't look like Huyck could get a patent position, so they wanted out. They also discovered that the Huyck Corporate Research Laboratories were producing more inventions, patents, and potential new products than the company could possibly absorb. Huyck also got into production trouble with several products that had come along before Corporate Research entered the picture. So Huyck dropped the *entire corporate research program,* writing off about $2.5-million spent over a five year period. They also convinced themselves that they could not afford to develop the marketing know-how for any of the new products we were coming up with. They succumbed, as have so many other small companies, to the "Harvard Business School Syndrome": Don't develop new technology and products yourself, but wait until somebody else does and then buy the whole schmear, product, production, and marketing know-how in a big package. My employment agreement was written in a way that I wasn't sure what I could talk about...then.

Dr. Wayne Batteau suffered a fatal heart attack in Hawaii while diving with dolphins. He had also done considerable work in that area.

I don't know where Flanagan is. He worked for NASA in Houston for a time in computer programming. The last I knew, he was somewhere in California as one of the top experts in pyramidology. I suspect I will hear from him as a result of this, and I'll welcome it.

Big Science did not kill the neurophone. It was complacent, and it really didn't know anything about the device. Academia was not really consulted. The neurophone has been dormant for fourteen years now because of the failure of nerve and imagination in the sales and marketing department.

But, *now,* there appears to be a need for the neurophone to take the final step toward direct communication between ourselves and our crystalline symbiotes/servants, the electronic computers.

Yes, I am still interested in this area. I am interested in anything and everything. But do not—repeat, *do not*—write to me or telephone me and ask for free information. I am a writer and a consultant, and my business is information...and the only thing of real value that you or I have in this world is *time.* I didn't write this soliciting business; I wrote it to report to you that the intelligence amplifier is just around the corner and awaiting you bright people out there to put it together right so that humans stay in control of intelligence amplifiers.

Now, what can we do in the future to integrate the creative process of "invention" more fully into the process of research, development, production, and marketing? Hang in there... ■

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DOLPHIN MISSION

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He was a lovely Youth! I guess
The panther in the wilderness
Was not so fair as he;
And when he chose to sport and play,
No dolphin ever was so gay
Upon the tropic sea.

from Ruth by Wordsworth

Carlos Cordoba, a Peruvian sailor and poet, was lost at sea and presumed drowned in 1928. Almost thirty years later, in 1956, while on an archaeological expedition to Easter Island, Thor Heyerdahl was presented with a weather-worn Bible by the natives. It had been found on a tiny, uninhabited island to the southwest. Its margins contained sections of a journal written by an individual who identified himself as Carlos Cordoba.

The journal remained untranslated for more than twenty years until Erling Gjessing, a Norwegian archaeologist, realized its importance. With his friend Professor Bjarne Maaland, a marine biologist and linguist at the University of Oslo, he produced the work that follows. It is published here in English for the first time.

Much of the Bible was badly damaged by salt corrosion. From what we have of the initial sections, however, they seem to be similar in substance to accounts such as Defoe's Robinson Crusoe *and the true adventures of Alexander Selkirk on which they were based. Of primary scientific interest are the entries from 1947 to 1952, and these have been well preserved.*

The reader will be aided by knowing that Dolphin Island, the name given it by Cordoba, is approximately five kilometers in length and is crescent-shaped. It harbors a freshwater spring, groves of screw-pine fruit and coconut palm trees, and a variety of shellfish and worms. Cordoba's dwelling consisted of a large dugout which was covered with a thatched roof. The dolphins described in the account are the Delphinus delphis *or common dolphin. Gjessing and Maaland have added a few notes to the text where clarity and scientific accuracy have required it. Other than these, the words of the journal are those of Carlos Cordoba himself.*

JANUARY, 1947

"Call on me in the day of trouble, and I will deliver thee, and thou shalt glorify me." Many years ago I called upon the name of the Lord, and I have been delivered. But I am haunted and have little peace. Have I repaid the debt, glorified the Lord sufficiently? Has my mission here just begun, and is it already nearing completion? How am I to know? I feel like an empty urn,

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waiting to be filled; like a branch adrift upon the sea. The infidels of the New Testament were always clamoring for a sign: Show us a sign O Christ. Show us a sign that we may believe in Thee.

I believe, but is it wrong to also ask for a sign?

APRIL, 1947

Nina and Marco have appeared again after an absence of most of the summer. We have spoken at length of the creation and of God that we must all worship. Nina insists on testing me, insisting that God is a great white whale that lives in a deep, distant sea. *The whale is the ruler of the planet*—a planet so designed that it can only be effectively ruled from the sea. They have much to learn. I *must* convince them that god is a man like me, but far more powerful and wise. Surely God has placed me on this Earth to convert these magnificent creatures to Christianity. With the help of St. Francis I must not fail.

"Truly my heart waits silently for God; my deliverance comes from him."

DECEMBER, 1947

I have made my first conversion! Patrick, one of the youngest and brightest of my friends, has professed his faith to me. I had hoped for Nina or Marc, but my joy will only be that much more great when they too join the flock.

The baptism was the high point of my stay on the island. Patrick's cousins lined the shores and splashed happily as I called Patrick out of the water in the name of the Father, and of the Son, and of the Holy Ghost. On shore, Patrick firmly renounced Satan and all his works. The ceremony was completed by pouring white sand over his forehead. I was so excited that I got some sand in his blow hole, but Patrick was brave, did not cry out. Perhaps this is the sign I have prayed for.

JULY, 1948

Despair like a swarm of flies infests my hut. Am I worthy of my mission? How can I, a lowly shipwrecked seaman, preach the word of God? And are there some for whom the word of God was not meant? Some who can find happiness and peace and fulfillment outside the Gospels?

When my own people brought Christianity to Easter Island, they brought ruin with them, and the natives turned on them and drove them out. We then forced them to be slaves in our ships and in our mines; and finally succeeded in almost destroying their race entirely with our small pox.[1] Who am I, a representative of that barbaric civilization, to say who is savage and who is civil; what is an advance and what a retreat; what is an achievement and what a tragedy?

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[1]*Cordoba is apparently referring to the role of the government of Peru in Easter Island affairs. Between 1850 and 1862 Peruvians forceably abducted more than 1,000 natives for slave labor in their Chincha Islands guano mines. Most died. Those who were finally allowed to return brought smallpox with them. The ensuing epidemic was genocidal, reducing the population from 4,000 to a few hundred.*

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JANUARY, 1949

The shrill thunder of Nina's call woke me. When I arrived at the beach she gestured out to sea where, in the early morning haze, two of her friends were swimming slowly. As they approached, I could make out a human figure clinging to the dorsal fin of the larger of the two. When the dolphins swam him to shore, he greeted me with an almost frightening cry of joy. He was exhausted, and after introducing himself simply as Jack Sullivan, fell gratefully to sleep in my bed. I assume this is a prophet sent by God to help me in my work. He has been delivered from the sea like Jonah; and like Jonah he must spend the rest of his days preaching the word of God. When he awakes we shall devise a plan to convert all the dolphin nations for Christ.

"The waters surrounded me
right to my throat,
the abyss was all around me.
The seaweed was wrapped
round my head...
But you lifted my life from the
Pit,
Yahweh, my God."

This is a strange prophet. I record his genesis as he described it to me.

"About three days ago, when my ship, the steamer Royal Gardens, encountered heavy weather, I went up top to watch the storm. When the ship lurched sharply to port, I was thrown overboard. The storm was a real blaster, and no note was taken of my fall. As I watched the light fade in the blackness, I was certain that my death was only a matter of time. Half-frozen with cold and fear, my whole body trembling, I let myself drift with the current. Many times during the night I feel asleep, only to be wakened by a mouth full of salt water and vomit.

"Early the next morning I spotted what I though was a school of sharks, and determined to drown myself rather than let them take me alive. When they drew nearer, I saw they were harmless dolphins. They circled slowly for about two or three hours, and then one began squeaking at me. When one finally submerged and came up beneath me, I was ready. I grasped its dorsal, and was pulled through the water.

"The rest you know. Those dolphins are really something. My next job is to get off this island and back to my ship; I trust you can help me with that."

We spoke awhile longer, but nothing Jack said added much of substance to this account. I write this as he sleeps. When he wakes, I must convince him that it is God's will that he stay here with me among the dolphins. While he has made no comment on my physical appearance, I am sure I must appear almost savage to him. Persuading him to join my mission may be possible only with the intercession of the saints. St. Patrick pray for us.

FEBRUARY, 1949

My father and mother both died before I knew them, and I was raised by my aunt, an elderly spinster with a lisp and a withered right foot. She was

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very strict about my playmates, and forbade me to play with a young Indian named Maricibo. Nevertheless, Cibo (as I called him) and I became best of friends. Cibo believed that life was only what you made of it, and *No pidas de grado lo que puedas tomar por fuerza.*[2]

He thought that lying and stealing were part of living so long as you didn't get caught, and that the only way to survive in the world was to assume that everyone was out to get you. He considered the priests the biggest swindlers of all. For all his piety, the local parish priest, Fr. Luis Francisco, was sleeping with Cibo's younger sister—or so he said. In my ignorance I followed Cibo, believing my aunt to be a silly old woman.

One night Cibo and I decided to steal two horses from a neighbor's barn and run away. We entered slowly, about midnight. It was a moonless night, and no lamps burned at the rancho. We saddled in silence, using English saddles that smelled of fresh oil. Cibo mounted first and rode out at a gallop. Before he reached the gate, a cry went up. Two minutes later shots rang out. I panicked, left the horse in the barn, and fled out the back door and through the woods. The next morning my aunt told me that Cibo had been shot through the head while trying to steal a horse. *Quien busca el peligro perece en* él,[3]

[2]*Never beg as a favor what you can take by force. An old Spanish saying.*

[3]*Whoever goes looking for danger will perish by it. An old Spanish saying.*

she said. I left that day, and never saw my aunt again.

Jack reminds me of Cibo. Even though the dolphins saved his life, he wants to kill them for food. We have plenty of fish, but Jack insists he prefers dolphin meat, which he has sampled a number of times at sea. When I try to explain to Jack that dolphins are more like people than fish, that they can communicate with me and that I am converting them to Christianity, he laughs out loud and shakes his head.

He is not a pious man, but last night he took my Bible and read to me from Genesis: "...fill the Earth and subdue it, rule over the fish in the sea, the birds of heaven, and every living thing that moves upon the Earth." His eyes widened, and his tatoo-covered arms flailed the air as he described how he could lure a dolphin to shore and kill it with a sharp rock.

He frightens me. Perhaps he thinks that if he convinces me that he is a threat to the dolphins, I will show him a way to escape.

APRIL, 1949

Jack seems more and more intent on killing a dolphin. It is his view that man is a predator, and it is in the nature of man to hunt and kill. Since it is natural to kill animals, Jack reasons, it must also be right. I understand that because man is mortal man must die. But I do not agree with Jack that man must rehearse his own death by killing other creatures. It is this rehearsal that Jack finds "humanizing." I find it brutalizing.

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JULY, 1949

Jack caught me getting food from the dolphins this morning. I knew he would not understand the ritual, and so had not told him about it. Now I had to explain how, in 1930, the dolphins began to appear near shore and offer me fresh fish to eat. One day I threw one of the fish in the air as a sign of thanks, and was immediately given another fish. I repeated this act on subsequent days, and was always rewarded in the same way. After a few months I had worked out a routine whereby I would throw fish in the air and catch them, run down the beach holding one fish in each hand and do a somersault, and juggle three fish at once.

This series of maneuvers so excited the dolphins that they gave me all the fish I could ever desire whenever I did it. I went on to quote passages from the journal to Jack which indicated how, at the time, it seemed to me that I was training these animals to catch fish for me.

Within a year my actions became a ritual. Every third day at sunup a group of dolphins appeared to watch. They greeted my performances with squeaking outbursts, and did not seem annoyed when I varied the routine for my own amusement. After a few years two dolphins, who I call Nina and Marco, began to study my activities regularly. Eventually we learned to speak to one another, and now I consider them my friends. While they do not yet believe in the One True God and His Son, they are willing to talk with me about Christianity and permit me to try to convert the other dolphins to my religion.

While Jack listened courteously to my explanation, he has almost certainly concluded that so many years on this island have driven me insane. He refuses to take any part in my show for the dolphins, saying he would rather kill and eat them than allow himself to be fed by them.

OCTOBER, 1949

The only way Jack will ever accept life on Dolphin Island is to learn to communicate with the dolphins. While it has taken me more than fifteen years to learn enough of their language to carry on a reasonable conversation, with my help Jack should be able to learn much faster. Because most of their communication is done under water, and because they have no throat, tongue or lip involvement in their speech, humans will never be able to speak fluent dolphin. Nevertheless meaningful communication is possible with a patient dolphin; even though their language is more complex than any human tongue. Indeed, the only thing I have ever heard even resembling it is the whistling language of the shepherds of the Canary Islands. They can control and modulate their whistling so that it can be used to communicate complex thoughts over distances as long as three miles.[4]

[4]*Cordoba apparently visited the Canary Islands on one of his voyages. A similar method of communication is also used in the Pyrennes.*

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Dolphin voice out of water is similarly high-pitched, and can often sound like the creaking noises made by a ship whose timbers are under stress. Within this seemingly narrow range of possibilities, the dolphin contrives to hit almost an infinite variety of tones and variations. After only a few years of careful listening, one can distinguish the kind of wood being cut by listening to the voice of the saw. At times dolphins seem to be singing in celebration; at other times they scream like a baby who has just been spanked. Dolphins are also incredible mimics, and will repeat any human utterance that pleases them.[5] While I pride myself on my own ability to mimic their language, I am sure that I speak it with a terrible accent.

NOVEMBER, 1949

Today I attempted to begin Jack's lessons in dolphin. Nina kindly agreed to assist me, and we met her a few yards offshore. For the first lesson I planned only an exchange of names.

"NEE NAAH, NEE NAAH" I repeated, purposely exaggerating the vowels, and pointing at her, more for Jack's benefit than hers.

"NEE NAH, NEE NAH, NEE NAH" she responded, and swam more than thirty feet into the bay, lept into the air, and returned to her original position near the shore.

Jack was impressed, but he was trying not to show it.

"Now you tell her your name," I coaxed.

"Why would she want to know my name? Don't you remember, I'm the human that thinks it's OK to kill dolphins."

Jack's voice had carried a clear threat, and Nina turned and swam away calling "ACK, ACK," "ACK, ACK" until she was out of sight.

I tried to explain to Jack what a stupid thing that was to say in front of Nina, but he seemed to no more believe that Nina could understand him than that he could ever learn to understand her. "This dolphin-infested sand box is driving me nuts. You've got to get me off this island!" He shouted at me, but it seemed more like a plea.

JANUARY, 1950

I think I might be getting to Jack just a little. His resolve to leave the island has weakened at least to the point where he will talk about other things. Tonight we spoke of Our Savior, and he said I was so out of touch with reality that I wouldn't recognize him if he walked straight across the Pacific Ocean and onto Dolphin Island. I thought that a silly thing to say, but Jack replied:

"Face it Carlos, how would you know he wasn't simply some creature from another planet with strange powers?"

"I would know Him by His goodness," I replied evenly.

"But goodness can be faked,

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[5]*Many of Cordoba's observations about dolphin language have been made also by Dr. John C. Lilly. His most readily available works are* Man and Dolphin *(1961), and* The Mind of the Dolphin *(1967).*

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Charlie boy, and creatures with enough smarts to come here from another planet could certainly fool you. Even your fancy Jesus Christ could have been nothing more than some misguided traveler from another solar system, bringing a message we weren't ready to hear."

"I can't believe that." I had been staring at the stars every night for more than two decades, but this thought had never even entered my head. "But even if he was from another planet," I continued after awhile, "would that give you the right to crucify Him for His message of peace and love?"

"No, of course not," Jack agreed. "But I sure as hell wouldn't crown Him King of the Universe either."

Now I thought I had an opening, so I tried to quickly change the subject. "But Jack, if you couldn't kill an intelligent creature from another planet, how can you kill an intelligent creature on your own planet who asks only to live in peace?"

Jack looked like he was thinking it over, but finally stuck to his position: "Dolphins aren't intelligent in the same way humans are. They don't talk like we do. They can't build things like we do. I still say they're more like fish than humans, and even you eat fish for all your sanctimonious talk." Finally he got up from the fire, exclaiming with a voice that was a mixture of confusion and disgust: "I'm going to bed before you have me talking your Jesus Christ jibberish to those pigmy whales."

Jack left. I stayed, thinking. Surely when Christ exhorted his apostles, "Go, teach all nations," He must have been talking about not only all the nations on Earth, but all intelligent beings, both here and on other planets. Surely Christ is the Savior not only of humankind, but of all intelligent animals as well, and His Dominion must surely cover the entire Universe. My task was becoming much more complicated than I had previously imagined.

I must not only teach the dolphins about Christ, I must teach men to communicate with dolphins. If this is not done, God's creatures will burn in hell for injuring and destroying one another, rather than rejoicing for an eternity in heaven for loving and protecting one another.

JUNE, 1950

I have given up on Jack. I must. Only my pride has kept me at this project which now threatens his life. Jack has given in to a deep depression, and has stopped eating almost entirely. His strength of body seems to be diminishing in proportion to his loss of will to live. I have begun work on a raft, and it is my hope that he will join me in this project. If he does, we could have a raft on which Jack might survive ready to sail by the summer. Noah's project seems no more urgent than my own.

JULY, 1951

More than a year has passed since my last entry, and almost that long since I have seen a dolphin. Late last winter, Jack enticed Nina on shore, by

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what means I have never been able to learn. Perhaps he assured her that he wanted to begin his lessons in dolphin again; perhaps he just pretended to be in severe pain and she came to his rescue. No matter the scheme, when Nina was on shore, Jack rushed her and drove a sharp stone deep into her belly. Her death screams flooded the island—screams of pain and surprise.

By the time I arrived on the scene Nina's white stripes were covered with crimson; her voice silent; her dead eyes wide with amazement. More than a hundred dolphins lined the shore, waiting for what? Jack stood over Nina and stared at me. "It was my right to kill her; my right as a man," he said evenly. But before he could continue, I had picked up the stone, and as he opened his mouth, I drove it through his forehead. I hit him again, and again. It was only the cry that rose from the assembled dolphins that made me stop.

When I stood up, the island was silent. There was no breeze, and the dolphins had fallen still. "An eye for an eye," I managed weakly, but the dolphins were not listening. They slowly turned, and swam away.

That day I buried Nina as she would have wished, at sea. Using the partially-completed raft, I towed her body out beyond the breakers, and let the current carry her to her final resting place. I buried Jack on the island the next day. There was no one to pray for him. I am now truly alone for the first time in twenty years. I have considered suicide many times, but I seem to be too much of a coward even for that coward's act.

MARCH, 1951

Patrick has returned! He has informed me that I have been placed off limits by the dolphin community. I was the first human ever to be taught dolphin, and the experiment has been declared a miserable failure. The decision to teach me in the first place was one that badly divided the dolphin community. Now the minority have become the majority, and communication with humans has been shelved for at least another century.

Why should Patrick tell me this? Of course. He is a scientist whose primary subject is *homo sapiens.* Even his conversion was a ruse to be able to study me closer. Since he believes communication between our two species is inevitable, he believes research into the human mind must continue. He has risked personal exile by returning to Dolphin Island to study my reactions to the tragic end of my mission.

We cannot stay here. A dolphin patrol will check the island at random intervals to assure that all communication between me and any member of the dolphin community has been terminated permanently. Patrick has outlined the choices: I can kill myself (an option I have already rejected); I can stay here, alone; or I can accompany Patrick to another island he knows about three days swim from here.

Tomorrow I leave with Patrick, but on condition that he stop referring to me and Jack as Cain and Abel. ■

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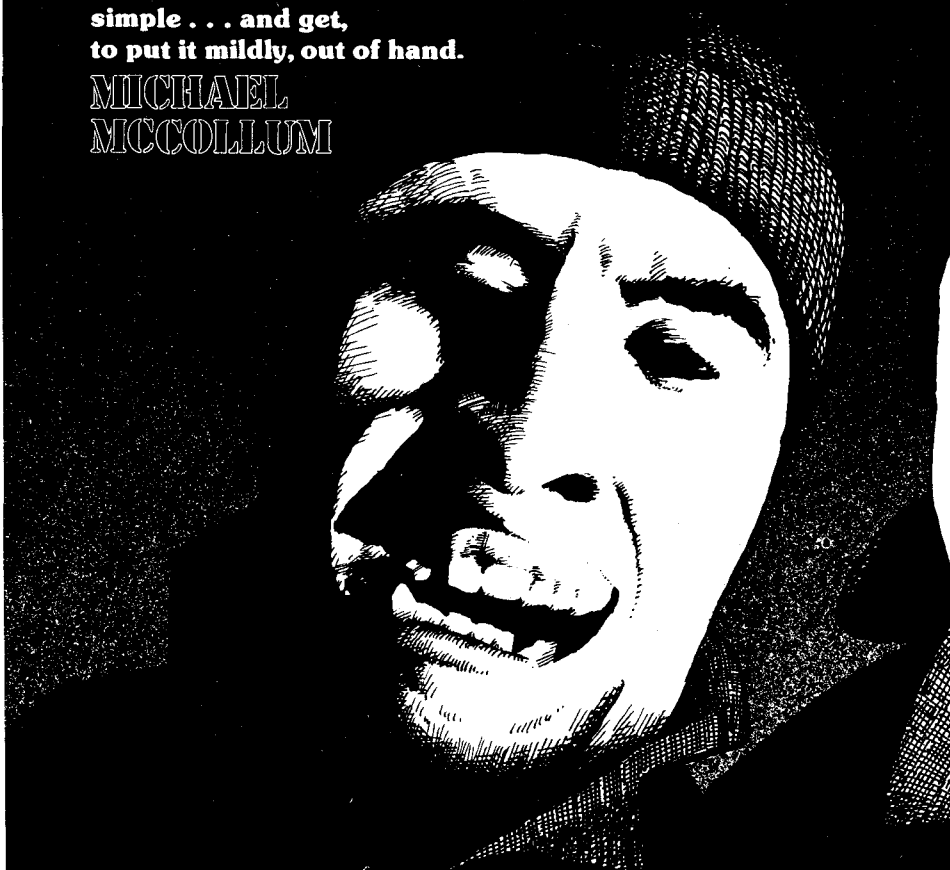
BEER RUN

Some missions start out simple . . . and get, to put it mildly, out of hand.

MICHAEL MCCOLLUM



It was midwinter, one of those crystal clear nights where the almost freezing wind whips in off the desert from the east and the moon bathes everything in a bright, pearly glow. Hal, my landlord, was off to a science fiction convention back East and the UFO Spotters were using our place—a dilapidated rooming house in the old section of Tempe near the University— for their monthly meeting. Being the only roomer in residence (the others having taken off for parts unknown, it being semester break) I was assigned the job of keeping them from tearing up the place and making sure the cops had no probable cause for a drug bust.

They came drifting in about eight. By the time the formal meeting had started, there were fifty-odd people scattered in the various nooks and crannies around the old house. And I mean fifty *odd* people! In Hal's

Richard Anderson

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absence, Weasel Martin took over the meeting. Weasel is a short, bearded graduate student whose most prominent feature is his nervous tic. He banged on a table with a wooden spoon to get their attention and called the meeting to order.

I was in the kitchen dishing out taco chips and bean dip. Jane Dugway was helping me, as well as pulling the pop tops off two dozen cans of Coors. Somehow they managed to disappear into the other room as fast as she opened them.

I had first met Jane at school. Even though I'm an engineering major, the University is bound and determined that I get a well rounded education. So in order to complete my eight hours of social studies required to graduate, I took a course in anthropology. Jane was a graduate student in Anthro and my discussion group leader for one semester. She is not one of those lucky

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women blessed with the gift of beauty. Her hair has a terminal case of the frizzies, and the coke bottle glasses do nothing to improve her image. But there is a mind behind that mannish face of hers that is as sharp as a razor blade.

We carried the taco chips and bean dip into the living room just as Weasel Martin called for old business. PeeJay Schwarz got to his feet and began an excited narrative about an Alabama farmer who claimed to have been to the moon on a flying saucer. Weasel ruled him out of order. PeeJay sat down with a thump and a pout on his face.

After that things settled down considerably. It might as well have been a meeting of the League of Women Voters, with everything run in strict adherence to Robert's Rules of Order. I was fast losing interest when Joel Peterson decided to get the evening's debate launched. Joel is a prissy sociology major who wears bowties with his blue denim shirts and dirty levis. He revels in being the club skeptic and is especially skilled in sparking controversy.

"I don't believe in UFOs," he declared loudly. "Not as interstellar visitors, anyway."

There was a murmured undercurrent in the crowd—something like you see in the movies just before the lynching. Weasel Martin got red in the face and prepared to smite the unbeliever.

"Then you're dumber than you look," he said to Joel. There was a scattered round of applause and a couple of muttered comments that that must be pretty dumb, considering his looks.

I had to give Joel credit. He stood his ground. "What makes you think UFOs aren't just a mammoth hoax? Have *you* ever seen one?" It was a good attack. Although several members claimed to have spotted UFOs, everyone knew that Weasel Martin never had, and considered that fact a personal affront.

The wrangling went on for another half hour before Weasel got fed up. "Okay, smart ass! If they aren't visitors from other stars, what are they? And don't tell me swamp gas!"

There was a pregnant pause. Joel got a smug look on his face. His trap had been set, baited, and sprung. "They're time travelers from the future, or maybe from a parallel universe," he said in triumph.

This was greeted by a chorus of Bronx cheers, boo's, and catcalls. Weasel was about to launch his counterattack when Sam Grohs pushed open the kitchen door and diverted everyone's attention.

"Hey, what happened to the beer?"

"Gone? Hey man, I'm dying of thirst."

Then the general chorus began. "BEER RUN, BEER RUN, WE WANT A BEER RUN."

Weasel took time out from the debate to look around. He found someone's discarded cowboy hat and passed it to the assembled congregation. "Okay, you turkeys. Ante up for

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a beer run."

While the hat made the rounds, Weasel gave us all the once over with his eyes. "Who'll make this run?" he asked.

"Duncan MacElroy," someone in back piped up. "He's not doing anything."

The chant began again. "DUNCAN, DUNCAN, DUNCAN."'

I didn't join in the chanting. I'm Duncan and I didn't want to go out into the cold to buy another case of beer.

"How about it, MacElroy?" Weasel asked. "Want to make a run for us?"

I shrugged. "Why not? But I can't carry it all by myself."

"I'll go."

I turned around to see Jane Dugway get to her feet. I might have predicted it would be her. Jane is one of the few people in the club who ever volunteers for anything.

"Okay, wait a sec while I get my coat," I said.

Jane waited for me on the sidewalk out front, bundled up in a fur coat with her black leather purse over one shoulder.

"Got the money?" I asked.

She nodded. "Shall we take a car?"

I looked around. I could barely see my Jag through the cluster of parked cars that slopped over from the driveway onto the front lawn. "I'm parked in," I said.

"Me too. I guess we walk."

"Okay," I said. "It's only two blocks." We set out at a leisurely pace up Oak toward the red and white sign of our local convenience market.

The liquor coolers of the market were sparse hunting. We finally ended up with twelve six pacs of three different kinds of beer. I loaded them into two sacks and we started for home.

The conversation drifted to anthropology. I walked in front, feeling my way over the tilted, broken slabs of the sidewalk, discussing a pet theory I'd developed about the affinity of modern Americans for vicarious enjoyment via the boob tube. The next thing I knew there was a hard shoulder in the small of my back and I was flying head over heels into a hedge of Texas sage. I landed on my belly amid the clatter of aluminum cans. Two of the cans burst on impact, spraying me with a cold shower of carbonated hops.

I spit out a mouthful of dirt and grass and turned over. It was dark there in the shadow of the hedge, but I could see Jane lying flat on her belly peering down and across the street at something.

"What was that for?" I asked.

"Quiet," she hissed.

"What the hell is going on here?" I asked, sitting up. I wrinkled my nose as the wind carried an odor to me. I smelled like a brewery.

She reached up with one arm and pulled me down again. She was surprisingly strong and I could feel the bruises where she had grabbed me.

"If you value your life, stay down."

I opened my mouth to reply, then

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shut it again. I had just caught sight of the gun.

Except it wasn't a gun. Even in the gloom with only scattered patches of moonlight to see by, that much was obvious. The thing in her hand was a weapon of some kind. It had a handle, a trigger, and a trigger guard. But the barrel was a long thin glass pipe that glowed with a faint blue fluorescence. My mind sorted through its dusty files and came up with a name for that glow. Cherenkov radiation! It was the glow of a nuclear reactor under two dozen feet of water.

"What's going on?" I asked.

"Over there," she said, gesturing toward a large oleander hedge halfway down the street on the other side. "At the base of the oleanders, about twenty feet from the end."

I strained my eyes, conscious of how much the cold wind bit into me where the beer had soaked into my clothes. The spot she named was fairly well lighted by the corner street lamp, but I could see nothing.

"I don't see anything," I said.

"Look closely. See the area that seems to be fading out of focus?"

I squinted. I wasn't sure, but I thought I saw what she referred to. Some trick of light and shadow caused a small section of bushes to advance and recede while I watched. It was like seeing something under water, all blurry and changing.

"I see it," I said.

"That's a Dalgiri aversion field. One of them is watching your house."

"What's a Dalgiri?" I asked, thinking I was being set up for a joke. You know: What's a Greek urn? Oh about two dollars an hour.

"A *near man* and my mortal enemy," she said, glancing up and down the street. Somehow she didn't look the type to have enemies. "He will try to kill me if he can. You too, I'm afraid, if he sees us together."

"What the hell is going on here, Jane?"

"Shh," she said, placing a finger to her lips. "I'll neutralize him. You stay put."

Without waiting for an answer, she crawled into the black, leaving me to listen to the rustle of the wind through the bare limbs of the trees.

I lay still for nearly five minutes, feeling more foolish by the second. Joel Peterson had put her up to this, I decided. It was just his kind of joke. I felt a flush rising in my cheeks. I got to my hands and knees and peered over the Texas sage.

A bolt of lightning flashed before my eyes.

There was no answering thunderclap, no sound at all. But the blast of searing light cut into my eyes like a knife, followed quickly by a sudden wave of heat. I dropped to my stomach once more, whimpering in panic. The night returned to normal. Darkness closed in again except for the whirling after-image of the flash which continued to dance before my eyes. And besides the odor of stale beer, another stink penetrated my nostrils. There was a strong smell of ozone in the air.

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Nothing happened for two minutes and I risked raising my head once more. The white splotches were still carved into my retinas, but my vision was clear enough to see Jane in a crouching run across the street to where the oleanders reached the sidewalk on the other side. She disappeared into the dark. I waited one more minute and then scrambled to my feet and raced after her.

I found her kneeling over the body of a man. He'd been no beauty in life, and his looks hadn't improved in death. He stared unseeing at the moon, a gaping hole burned in his chest. The wound smelled of cooked flesh. I gagged twice, trying to keep the beer and taco chips down.

"My God, Jane! What have you done?"

She looked over her shoulder at me. "I thought I told you to stay where you were."

"You killed him!"

"He would have killed me."

"With what? For all you know he was just some poor peeping tom."

She felt around in the bushes where the dead man's hand disappeared into the shadows and came up with a gun similar to hers. It too had an oddly shining glass barrel.

What's going on here?" I asked.

"No time, Duncan." She turned to look directly into my eyes. "I need your help. Where there's one Dalgir, there'll be others. Can I count on you?"

"Sorry, but when it comes to murder, I draw the line. See you around!" I backed out of the hedge hastily, turning to run.

"Wait!"

I felt a prickling sensation run up my spine. I'd almost forgotten the gun she held.

"For what?" I asked, turning back to her.

"Hear me out. Then if you want to leave, go ahead."

"Okay, start talking," I said.

"Well, firstly...this is a Dalgir, a *near man.*"

"Okay, you've already told me that. Now what exactly is a Dalgir?"

"You would name him Neanderthal. One of a race that died out fifty thousand years ago on this timeline. On others, however, they survived and prospered. It is such a line that I and my people war against."

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flags *There is a hopeful symbolism in the fact that will not wave in a vacuum; our present tribal conflicts cannot be sustained in the hostile environment of space. Whether we like it or not, our children will find new loyalties when they set foot on the moon, on Mars, or the satellites of the giant planets.*

ARTHUR C. CLARKE

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I looked at the corpse. Damned if he didn't look like the Neanderthal exhibits in the museums. Jutting bony eye ridges, sloping forehead, slouching posture as he lay in death. But the Neanderthalers in the museums hadn't worn hunting clothes straight out of the Sears catalog. And they hadn't carried glass barreled pistols that emitted Cherenkov radiation as they lay quiescent on the ground.

"Timeline?" I asked.

"A parallel universe with its own history, culture, and peoples. Joel Peterson was speculating on the concept only half an hour ago."

"I hope you think up a better story than that before the police arrive," I said, turning once more to leave.

"If I'm not from a parallel universe," she said, a hint of humor in her voice, "how do you explain these?" She gestured to the two guns.

She had me there. I'd attended a couple of lectures on laser weapons. One thing every expert agreed on: a laser pistol with a six inch barrel was theoretically impossible. Except a dead man lay at my feet with a hole burned in his chest by just such a weapon.

"Okay," I said. "Let's suppose you are telling the truth. What do you want me to do about it?"

"This Dalgir was waiting to ambush me even though they aren't supposed to know this timeline exists. The very fact that he's here is a disaster. I must report."

"So report," I said. "But take this body with you when you go."

"I need you, Duncan. You have to help me dispose of the body. It would never do to have it discovered by the local authorities."

I chewed on my lip, squirming on the horns of the dilemma. I've never even been late paying a parking ticket. And here I was being asked to cover up a cold blooded murder.

So why did I choose to help her? Damned if I know! Maybe down deep I really believed her story.

"Okay," I said, regretting the decision even as I made it. "What do you want me to do?"

"We need some place to dump the body where it won't be found for eight hours or so."

I lifted my right arm and pointed west. "There's an old weed filled ditch that parallels the Southern Pacific tracks a half block over. How about there?"

"It'll have to do. Grab his arms. I'll take the legs."

"No."

"No?" she asked, perplexed.

"No. Not until you hand over that firepower."

I could see indecision flash across her face.

"Look, Jane, you are going to have to trust me. You haven't got any choice."

"You'll see me safely away?"

I nodded. "I don't know why I believe such an obviously ridiculous story . . ." She opened her mouth to say something. I held up my hand and she closed it again. ". . . I know,

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you've got a Buck Rogers ray gun. So hand them over or I take a walk."

She bit her lower lip, but held out her hand with the two lasers in it. I took them. They were warm to the touch. I hesitated.

"These emit anything that might disagree with my gonads?" I asked.

She shook her head. "Both beamers are well shielded."

I slipped the guns into my belt in back, hiding them under my jacket. "Fine, let's get rid of Mr. America here."

The Neanderthaler was heavier than he looked. He was barely five feet tall, but chunky. We half carried —half dragged him through deserted backyards and trash strewn alleys. When we finally lowered the body at the edge of the ditch, I stood up and puffed from the exertion.

"Strip him!" Jane said, working to loosen the leather belt he wore. There were a dozen or so pouches on the belt and she quickly sorted through them.

"What have you got there?" I whispered as I worked to peel his pants off.

"Equipment kit," she whispered back. She pulled each strange mechanism out of its pouch, examined it, then put it back. About the time I had managed to remove the Dalgir's shirt she found what she was apparently looking for. It looked like a tear gas pen—you know, the kind they advertise in all the men's magazines.

"Okay," I said as I stripped the last of the clothing off the body. "What now?"

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The Dalgir lay obscenely exposed in the moonlight, and not because he was naked. It had more to do with the hole in his chest.

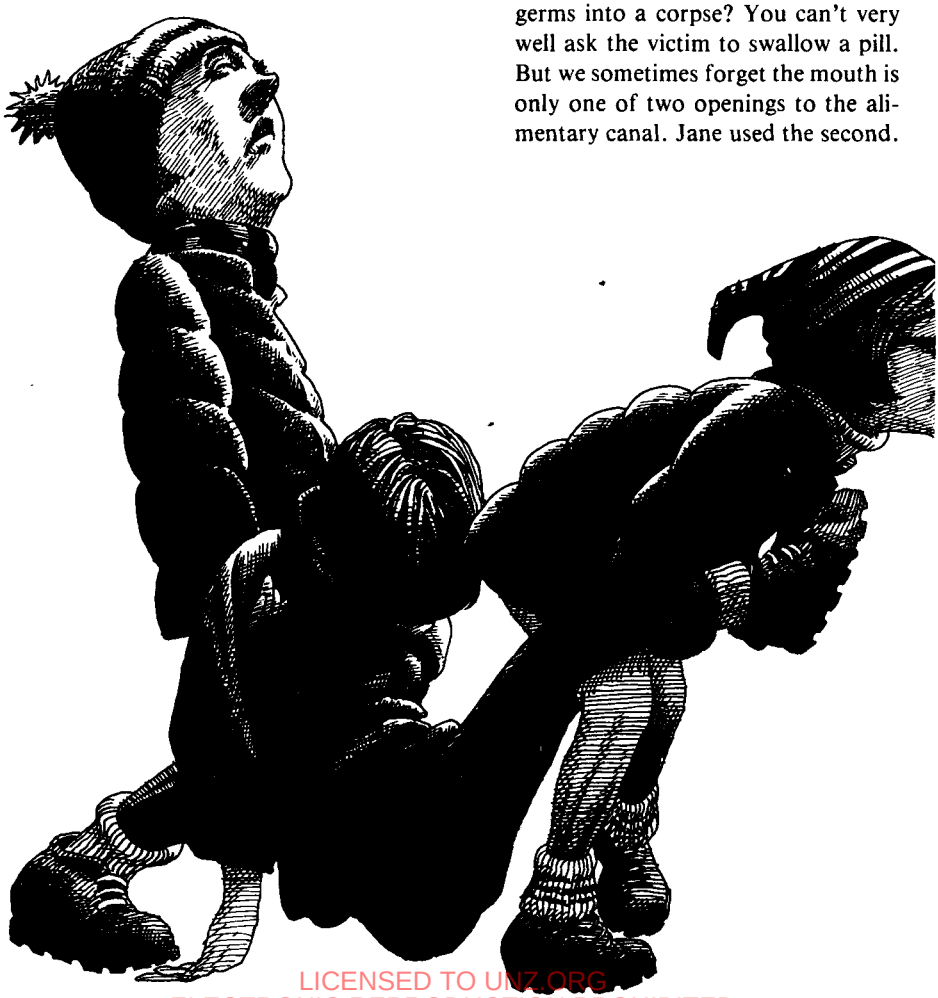
"Roll him face down into the ditch and then get back," she said, pulling on gloves from her purse. She held the tear gas pen gingerly in her gloved hands.

"What is in that thing?"

"A specially mutated bacteria. Get any of it on you and you'll be dead of what appears to be an advanced case of leprosy in a matter of hours."

That was enough warning for me. I backpedaled until I was a good fifty feet away, carrying the bundle of clothing with me. She bent over the body and did something with the pen. What she did made a certain amount of sense . . . in a gross way.

How does one solve the problem of introducing a strain of man-eating germs into a corpse? You can't very well ask the victim to swallow a pill. But we sometimes forget the mouth is only one of two openings to the alimentary canal. Jane used the second.



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She quickly rejoined me, carefully pulled off the gloves, and buried them in the center of the charred clothing, which she tied in a bundle. She leaned down and stuffed the bundle into the storm sewer.

"Let's go back for the beer. The others will be getting worried." As she turned to leave, the light caught her face. I could see droplets of perspiration on her forehead in spite of the chill wind that blew around us.

"What about . . ?" I thrust my thumb over my shoulder toward the irrigation ditch.

"In eight hours there will be no trace of our departed Dalgir. Now we have to report."

"How?" I asked. "I'm afraid my subspace radio is broken at the moment."

She laughed, a high nervous giggle. Reaction was setting in. "Then we'll just have to rely on Ma Bell. We'll use the phone in the rooming house."

The debate was still going hot and heavy. I lugged the beer into the kitchen while Jane went to the telephone in the hall. She carried it to the length of its cord into the bathroom and shut and locked the door. I stationed myself outside on guard duty. With my ear half pressed against the wall I could barely make out her side of the conversation. Not that it did me a lot of good.

When she spoke it was in rapid fire gibberish which somehow reminded me of an orchestra tuning up for the big concert. After a few minutes in which she did most of the talking—to judge by the short silences coming through the wall—she said goodbye in English and hung up.

I was waiting for her when she unlocked the door and stepped into the hall.

"Well?" I whispered.

"They're sending a shuttle to pick me up. It will arrive tomorrow after sundown."

"Where?"

"The Mogollon Rim north of Payson."

"I know the area. One of my uncles has a cabin outside Cristopher Creek at the base of the Rim."

"Then you'll take me there? I don't dare use my car. They may have managed to put a tracer on it."

"You're out of luck. The whole north country is knee deep in snow this time of year. My Jag was never designed to play snowmobile. We'll have to find a Jeep."

Tony Minetti chose that time to head for the bathroom. He heard the last of our conversation.

"Jeep?" he asked. It was then that I remembered that Tony had an old relic of the Second World War that he kept parked in front of his apartment six blocks away.

"Yeah," I said. "I promised Jane I would drive her up to Payson tonight. She just remembered that her Aunt Agatha was expecting her for the holidays. How about it, Tony? Can we borrow your Jeep?"

He bit his lip. "I don't know, man. You're talking about my pride and joy." He wrinkled his nose. "Boy,

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you smell like a brewery!"

"Spilled some beer on myself." I took a deep breath and made the ultimate sacrifice. "I'll let you borrow my XKE." Tony had cast a lecherous eye on my car for as long as I'd known him.

"It's a deal, man!"

We exchanged keys with me wondering if I was making the mistake of my life. Jane and I headed for my bedroom and began digging in the closet for some warm clothes. Coming originally from Michigan, I had an ample supply.

When we were outfitted for snow—Jane in my blue B-9 parka over her coat, and me in my heavy leather jacket and boots—we slipped out the back way. Joel Peterson was screaming something about parallel universes while the crowd around him booed in unison.

As I stepped out into the cold dark on the back porch, I couldn't help smiling. If they only knew!

Arizona—land of parched, overheated deserts and a dozen different kinds of poisonous insects, snakes and lizards; where rain doesn't fall for six months at a time and the natives huddle in air conditioned warrens for a quarter of the year, dashing outside only long enough to dodge from one cool hideyhole to another. Right?

Half right.

That's a pretty accurate picture of the southern desert. The northern part of the state, on the other hand, is blanketed with high mountains and lush forests. Driving down from Detroit on the Interstate, I was amazed to discover the amount of variation in climate that can be found in a hundred mile stretch. It made for interesting driving.

Except now I was driving like a madman into the high country in a forty-year-old jeep whose canvas top had never been meant to withstand a dozen years of desert sun. Two gaping holes ducted a freezing slipstream of air in to overpower the ancient heater. Jane and I were nearly blue with cold as the wan yellow headlights flashed across the dilapidated log walls of my uncle's hunting cabin.

I pulled off the road into the high snowdrifts surrounding the cabin. The Jeep's transfer case growled in protest as we slithered and bulled our way the last hundred feet. It almost sounded grateful as I turned the key, allowing the wheezing old engine to finally rest. I left the lights on to show the way to the porch, with me breaking trail and Jane stumbling after.

It was three A.M.

I got the door open and ushered her inside before going back to turn off the headlights. When I returned to the cabin, she had set up something that gave off a pearly white glow on the kitchen counter. I glanced at it and recognized one of the devices we'd gotten off the Dalgir's body. I headed for the fireplace and began stacking wood against the blackened grate. Within five minutes cheerful tongues of flame were licking at the wood.

"Get over by the fire," I told her.

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"I'll go out back and get the generator started."

My boots made soft crunching noises as I made my way through the virgin snow to the shed out back of the cabin. By the time I'd plowed a path to the shed—actually an old outhouse that had been expanded and converted for storage—I was panting from the unaccustomed exertion and high altitude. In spite of the cold, beads of perspiration trickled down my back between my shoulder blades. I took off my fur-lined jacket and hung it on a nail in the generator shack.

I checked the gas and oil in the old, rusty generator using a flashlight I'd picked up in the cabin. Crossing my fingers I pulled on the starter rope. For once it caught with a roar on the first try. I fiddled with the choke until the inevitable case of hiccups passed. Throwing the large knife switch on the spiderweb draped wall, I listened for the sound of the generator coming on line.

When I got back to the cabin, the fire had taken some of the nip out of the air and the lights were burning brightly. I began to unlace my boots. It had been a helluva night and I was dead tired. Jane was puttering around in the bathroom, doing I had no idea what. With the water turned off for the winter to keep from bursting a pipe, the bathroom was one of the less functional rooms in the cabin.

I busied myself with the fire until I heard soft steps behind me.

"Well, what do you think?" she asked.

I turned around. "What do I think about what . . ." I asked, catching my breath.

She stood on the Navajo rug in front of the fire and posed like a model out of *Mademoiselle.* She had made dramatic changes in her looks. Her hair was neatly combed, no longer standing out at right angles to her head. Her coke-bottle glasses were gone to reveal a pair of sensitive eyes which were now violet. They had been brown. She had done something to her face too. What, I couldn't be sure. It was a bit rounder and softer than it had been.

She still wasn't beautiful, but she was far from ugly. In fact, she was quite pleasant looking. As I stood speechless and checked out the changes, I noticed that her figure seemed to have improved as well.

"Like it?" she asked, pirouetting for me.

"What happened?"

"How do they say it on television? My cover is blown so there is no need to continue the masquerade."

Her comment brought me back to reality, a place I hadn't been in a number of hours.

"Which reminds me." I said. "Tell me about parallel universes."

She bit her lower lip and looked worried. "I supppose I do owe you an explanation, Duncan," she said, sitting crosslegged on the couch, patting the cushion next to her. I sat down beside her and caught a whiff of her perfume for the first time.

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My heart began to beat faster of its own volition.

"You can begin any time," I said, more to change the subject of my thoughts than anything else.

She cast her eyes down at the floor. "I shouldn't. It's against regulations to discuss paratime with the natives."

"We're both a little bit pregnant in that department aren't we?"

"A little bit . . ?" She looked puzzled for an instant, then her eyes got wide and she laughed. ". . . I confess that I hadn't heard that expression before, but I see what you mean. After last night, the regulations don't make very much sense, do they?"

"No, they don't."

"I won't bore you with the technical details about temporal energy balances between universes and entropic shock-waves. A good temporist goes to school for twenty years to learn about such things. Just take it on faith that your concept of parallel universes is a gross oversimplification of the true situation. Timelines just can't be thought of as parallel!

"Energy considerations are our biggest problem. They keep most of the timelines closed to us. And when a volume of low temporal energy *does* form—a paratime portal in other words—it is usually limited to a few square miles of area. A portal's life can be measure anywhere from milliseconds to thousands of years. There's one between my home timeline and the Gestetni Republic, for instance, that has been continuously open for over six thousand years. Others come and go intermittently, eventually closing forever as the two timelines drift apart. That's the case with your timeline, Duncan. The portal between our universes opened up five years ago. We will remain in intermittent contact for about a thousand years and then go our separate ways."

"So why have you people been skulking about?" I asked.

"Experience has taught us caution," she replied. "Terrible things can happen to a shuttle once it makes the jump 'tween universes. Not all of them having to do with the temporal physics of the situation either."

"Such as?"

"Oh, a million things. You can spend an hour in a strange universe and return home to find a hundred years have passed . . . or that time has run backwards while you were gone . . . or that no time at all has passed. The flow of linear time can be highly variable from timeline to timeline. We avoid situations where a large mismatch exists, but every paratime operative can expect to age at a different rate than family and friends.

"Then there are the nasty little surprises that people can pull on you. More than once a shuttle has jumped into an alternate history to discover the Earth ruled by powerful barbarians with both the yen and military might for empire. A thousand years ago one of our shuttles discovered the Dalgiri Empire that way. The discovery cost us three cities, including two on my home timeline. Since then all of our efforts have been bent

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toward containing that pack of wild dogs. They controlled eight timelines when we first met them—twelve now. In the same time we have grown from an alliance of three lines to a confederation of thirty-two. Of course, every time we almost get them boxed, a new portal opens up onto a Dalgiri universe from somewhere else and the battle begins again."

"Like this timeline?"

"No, not yet, Duncan. We have twenty years or so of grace before the Dalgiri get a direct line to your universe."

"So how is it they are here?"

She looked troubled. "A puzzle that must not go unsolved. Either they passed through one of our universes on their way here, or they can jump energy barriers of unprecedented magnitude. In either case, it's not good for either of our peoples."

"And what are your plans for us?" I asked.

"To study you for the moment, perhaps establish diplomatic relations later. I really don't know, Duncan. Such decisions are made on a much higher level than mine."

"So in twenty years we are going to play Poland to the Dalgiri's Hitler and your Churchill?"

"If not sooner."

"And you've given up your job as a spy to report that the Dalgiri are coming through earlier than expected?"

She smiled. "I guess I deserve that. I'm not really a spy, you know. At least not in the classic sense of the word. I am exactly what I claim to be—a graduate student working on her thesis in anthropology. Paratime anthropology, that is. But to answer your question: Yes, this is far more important than my information gathering function."

I suddenly felt very tired. What had started as a boring evening listening to Weasel Martin and the other UFO freaks had turned into something else again. Either I had stumbled onto the greatest adventure of all time—and I mean of *all* time—or else I was in the hands of a certifiable nut. The whole night had been like a dream and fatigue had worn me down until I could hardly think. I bit down hard on my lip, hoping the pain would clear my fuzzy head. I had some hard decisions to make.

"What's the matter, Duncan?" she asked, her voice a husky whisper. "Don't you believe me?"

"I don't know what to believe," I said. "I'm not making any decisions until I get caught up on my sleep."

"A good idea," she said, standing and stretching. Her newly lithe form flickered in the firelight.

"You take the bedroom and I'll take the couch," I said.

She smiled broadly and grasped her sweater at the hem, pulling it quickly over her head. "No need for false chivalry. My culture is not your culture—and I've been celibate much too long in this masquerade I have been playing at."

She turned and walked into the bedroom, her naked back beckoning me to follow. After a moment's tussle

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with my conscience, I gave in and followed. Suddenly the thought of not getting to sleep for another couple of hours didn't bother me at all.

I woke to the sensations of morning; the constant drip of melting snow running from the roof; the smell of breakfast cooking on the stove; the heat of pine speckled sunshine across my upper body. I smiled and stretched and opened my eyes. I was alone. I could hear Jane moving about in the other room. A sunbeam flashed through the window, scintillating dust particles in the air. By the angle, I judged the time to be around ten o'clock in the morning.

I raised myself up on one elbow and yelled, "Where are you, woman?"

She came to the door wearing oversized levis and a flannel shirt. "Morning, sleepyhead. I borrowed some of your uncle's clothes. I hope he won't mind."

"Uncle's a pussycat, at least where beautiful women are concerned," I said. She blushed at the compliment. I was surprised to realize that I really meant it.

"Breakfast is almost ready. Why don't you get up and get dressed? Lots to do today. We have to be up on the Rim by full dark. The shuttle could make the jump anytime after dusk."

She went back into the kitchen while I dressed. I put on the same clothes I had worn since yesterday morning, feeling slightly itchy at the prospect. I wished the water had been turned on. I could have used a bath. Running a hand across my chin, I scraped over the day's growth of beard. My tongue caressed slimy teeth. In spite of my general slovenliness, I felt pretty good. Some of the mental haze that had plagued me since things had started last night was gone.

Jane ladled pancakes onto a plate as I came out of the bedroom. I crossed over to where she stood and nibbled her ear. She giggled just like any red-blooded American girl. You'd have never known to look at her that she was a creature from another universe. I let my hands roam lovingly.

There was a sharp rap on the door.

Jane stiffened in my arms. "Who's that?"

I tried to keep my voice light. "Probably just the neighbors form across the meadow. They've seen the smoke and came over to get the latest gossip. It gets damn lonely up here in the winter."

She look around frantically. "The beamers?"

Now it was my turn to be startled. The beamers! What had I done with them? Then I remembered. They'd chafed me while tucked into my belt. So when we'd gotten back to the rooming house I had transferred them to the pockets of my leather jacket. The jacket that I'd taken off in the generator shack and which still hung on a nail out there. "Out back," I said, hooking a thumb in that direction. "Don't worry, I'll get rid of our visitors."

"Duncan Allen MacElroy?" the man standing on the porch asked as I

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opened the door.

I didn't bother to answer. There didn't seem a need.

The stranger was short and squat, with overhanging eyebrows. His wide smile showed a jagged row of teeth. Those weren't his most noticeable features, however. The beamer he held in my face guaranteed that I barely noticed his physical peculiarities.

The tinkle of breaking glass sounded behind me and Jane screamed. I whirled around to see a second Dalgiri level his beamer at her through the broken window.

After that, things seemed like a dream again.

In a matter of minutes three Dalgiri—one had been hiding out back in case we'd made a run for it—had searched us with brusque, impersonal efficiency and frog marched us into the bedroom. I was ordered to turn and face the wall, while a scuffle went on behind me. When I was finally allowed to turn back, Jane lay face up on the rumpled bed. Her body was curiously limp, her violet eyes gazed at the ceiling.

Then two of them grabbed my arms and the third applied a shiny steel box to my neck. There was a sharp prick and I too was limp all over. It was as though my body had gone to sleep from the neck down. They brusquely tossed me on the bed beside Jane and left the room.

From then on I didn't see anything but the flyspecks on the ceiling, although I had no trouble hearing them in the next room. They'd left the door open to keep an eye on us.

"Jane?" I asked softly. My mouth and eyelids were about the only things that still worked.

"Yes, Duncan."

"What happens now?"

Just then the Dalgiri started speaking to each other in their native tongue. I heard a brief "Shush!" from Jane as she listened intently. It's funny, but the Neanderthalers are always portrayed in the movies as talking in grunts. Hollywood has never been more wrong. They spoke a language that was more than a little reminiscent of French.

After five minutes the conversation quieted down and one of them glanced in at us. I waited for him to disappear out of the corner of my eye and whispered to Jane, "What was that all about?"

"It's bad, Duncan. Very bad. They've got a paratime communicator and are using it to call in one of their . . . call it a cruiser. It's an armed shuttle with a crew of two hundred. It's second only to our biggest warships in firepower and could easily destroy a continent."

"But why call in something that large?"

"To ambush our transport when it arrives. This mission is very important to them for some reason. I was right last night. They crossed over to this timeline through my home universe. The cruiser must come the same way. A lot of people at home will die tonight."

"What are we going to do about

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it?" I asked.

A short, savage sob escaped from her throat. "What can we do?"

If my shoulder muscles had been free to move, I'd have shrugged. It didn't look as though there was much *we could do.*

"If only we'd had the beamers," she whispered.

I felt a hot flash of anger at myself for being so stupid. Then I savagely put the thought out of my mind. There had been no reason to think they'd trail us here. "Look," I said. "If we'd been armed, we would now be dead. You saw the way they were deployed when they jumped us!"

"Maybe we could have won a firefight. Now we'll never know because the beamers are out with the generator."

It was then that I smiled. My mind began to race as I recalled several previous visits to my uncle's cabin. Not being hooked into the power grid was a real pain in the ass. You were forever having to go out and pump some more gas into the generator's fuel tank. Uncle had planned to build a reserve tank out of an old fifty-five gallon drum for years. But he'd never gotten around to it.

That meant the generator had fuel only for eight hours or so, even at the idle setting it used when there was no electrical load on the line.

"What time is it?" I whispered.

"About eleven. Why?"

I listened to the far off *put-put-put* of the generator. It was a sound that I'd not consciously heard since last night, even though it had been there all the time. Now it somehow seemed louder. I licked my lips and waited, listening for the noise to stop.

I waited for an eternity that probably lasted only fifteen minutes. Finally, it came. The soft chugging of the generator stopped, bringing with it a silence louder than when it had been running.

One of the Dalgirs was in the bedroom in a matter of seconds.

"What has happened?" he asked.

"Generator's out of fuel. Looks like you boys are going to get cold," I said.

"Never mind that. We need power for our communications beacon. How do we get it back?"

"Know anything about cantankerous internal combustion engines?"

"I'm no barbarian," he growled, sounding a bit like Ralph Nader.

"Then you'd better let me up so I can go get it started again."

He turned and yelled, "Rimbrick!" A second Dalgir came into the bedroom, leveling a beamer at me.

Then there was a sharp prick on my neck, followed by fire coursing downward through my body. My arms and legs began to twitch uncontrollably.

When the spasm passed they helped me to stand on weakened legs. I walked around the kitchen to loosen up a bit. Finally the second Dalgir, the one called Rimbrick, ordered me out the back door. We crunched our way to the generator shack.

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Once inside I set to work refilling the tank with gasoline, using an empty mayonaise jar to transfer it from the storage barrel to the fuel tank. When the generator was topped off I filled the jar one more time. Rimbrick stood warily two arm lengths out of reach in the doorway. I set the gasoline down next to the generator and began to putter around the mechanism. Then I picked up the jar in my left hand and leaned over to the big knife switch on the wall.

"Got to disconnect the load before I start it," I said. My body shielded my right hand from view as I brushed up against the coat on the wall. I waited breathlessly for the bolt of lightning in my back. Nothing happened. I reached into the jacket pocket and felt the cold handle of a beamer. Praying the safety was off, I mentally judged my distance from the doorway and whirled, throwing the gasoline in one quick motion.

It caught him full in the face. He screamed, instinctively throwing his arms up to cover his eyes. Then he realized his mistake and brought the beamer down to bear on me once more.

The hesitation was enough. I pointed my weapon at him and pulled the firing stud. There was a crash of light and the overwhelming stink of ozone. When I could open my eyes again, I saw Rimbrick down in the snow with the familiar hole burned through him. The gasoline had caught fire. Flames and a thin stream of black smoke rose upwards from his jacket.

I quickly grabbed the second beamer and headed for the cabin. I pushed the back door open and padded across the linoleum to the door opening on the living room. I hesitated. It had suddenly occured to me that I couldn't answer a very important question. Exactly whose side was I on? True, circumstances seemed to have thrown me in league with Jane, but was that what *I* wanted? She had killed the Dalgir without warning last night. What if she was with the bad guys and these Dalgiri represented the forces of law and order? What was an outsider like me doing mixed up in this mess anyway?

I pushed open the door to the living room, indecision laying on my shoulders like a sack of concrete. I'm not sure exactly what it was that I planned. Perhaps they would surrender if I got the drop on them. With the Dalgiri prisoner and Jane still drugged from the neck down, maybe I could sort things out.

The door squeaked slightly as it opened. Suddenly the whole question of right and wrong became academic. The leader faced me from across the room, a look of blank surprise on his face as he lunged for his beamer.

I shot him . . . and the other when he tried to quick draw against me as well.

Then I sat down and was quietly sick for a few minutes. Later I released Jane, following her instructions on how to administer the antidote to whatever drug they'd given us.

She wasted no time heading for the

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communicator. She did something incomprehensible to the controls and then cursed softly under her breath. Turning to look at me, she smiled sheepishly. "Darling, would you mind turning the electricity back on? They've drained their batteries."

I grinned. "Sure thing, boss."

I trudged back to the generator and quickly had it going again. When I returned to the cabin, Jane was just finished talking into the thing that looked like a portable radio. She snapped off the switch and turned to look gravely at me.

"Well?" I asked.

"Made it. I can't use this thing to talk across timelines without the Dalgiri hearing, but I did get our office in New York. They'll relay the message and a certain cruiser will have a big surprise waiting when it tries to cross over tonight. As for us, we wait here. The shuttle will come through right after dark to pick us up."

"Us?"

It was as though I'd thrown a switch. Her eyes got a strange look in them, as though she were seeing me for the first time. Then she was in my arms.

"They could have killed us while we lay helpless in there," she said between sobs.

I held her, softly caressing the back of her neck. "Why didn't they?" I asked.

She lifted her head from my shoulder and dried her tears. "Because of you."

"Me?"

"Never mind just now," she said, sniffing. "Come over here. There is something we must talk about."

We sat on the couch. I reached over to take her in my arms, but she pushed me away.

"Don't! You can't afford to have your mind clouded with emotion just now. You've a decision to make, the most important decision of your life."

"What decision?"

She gulped and regarded me with red eyes. "Whether you will submit voluntarily to having your memories of the last day erased, or will exile yourself from this timeline forever."

"I don't understand."

"Don't you see? You know about paratime! It's standard procedure to memory wipe any local who learns of our existence."

"That's gratitude for you," I said. I could feel the flush rising in my cheeks. Maybe I *had* picked the wrong side in this war.

"I know, Duncan. It's wrong! But civilizations sometimes can't afford the luxury of gratitude. It's a cruel universe out there. In fact, there are thousands of cruel universes throughout paratime. Sometimes we just don't have any choice."

"I don't suppose it would do any good to conk you on the head and make a run for it," I said.

She shook her head. "I reported your being with me the first time I called New York from the rooming house. By now headquarters has every bit of information filed with the federal government. By next week

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they will be down to the state and local levels. Within a few weeks at most they would hunt you down and you'd lose an even bigger chunk of memory."

"And exile?"

"You could join us, Duncan. The Paratime Service always needs good field agents."

"I don't care much for being drafted, Jane."

"Nobody does."

"For one thing, I'm not sure you people are right in all of this."

"All of what?"

"Your war with the Dalgiri. You *did* fire the first shot—and without warning—you know."

Jane's face darkened. It was as though a volcano was ready to erupt. She sat there considering her reply for a dozen seconds.

Then she exploded.

"You are damn lucky I did, Duncan MacElroy!"

"What?"

"Don't you see? How did that Dalgir track me down at your rooming house? And the three others. They found us here at your uncle's cabin. How? How could they possibly have known where we were?"

I shrugged. "*Damfino.* Haven't had much time to think about it."

"Well I know! They had a most interesting discussion when you went out with that one to fix the generator," she said.

"So?"

"They found us because *they were looking for you,* Duncan, not me!"

"I don't understand," I said in the understatement of the year. "Why would they be looking for me?"

"Because they were from our future, stupid! Don't you see what that means?"

"Huh?"

"It means that sometime in the next fifty years you are going to become a major problem for the Dalgiri Empire. In fact, you will be such a pain in the rear that they will be willing to mount an expedition across the timelines for the sole purpose of killing you! Don't you see? They found us so easily because they have studied your life since early childhood. They know you like an open book. The only thing that saved you was my chancing to spot that aversion field. Otherwise you'd be dead."

"From the future?" I mumbled stupidly about ten times.

"Yes, from the future," she said finally. "The five dimensional surface that describes paratime is convoluted beyond belief. Travel into the past is completely feasible—if you're willing to spend a few years waiting on some skewed timeline for the right portal to open up. There are timelines without number where time flows in reverse, you know."

"Years? They invested that much time in killing me?"

"Probably. You are important to them. Important enough to expend four field agents and an armed cruiser in the attempt. That makes you important to us."

I suddenly couldn't think of any-

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thing to say.

"Well?" she asked.

"Well, I'll be damned!"

"You certainly will."

The transport shuttle came through at full dark, guided to the cabin by the Dalgiri homer. It was an ebon egg some ten yards long that hovered a foot off the snowpack. The three man crew was briskly efficient. Within minutes they had loaded the dead into a cargo hold and began to clean up all evidence of the fight in and around the cabin. A fourth man, their passenger, conferred hurriedly with Jane while I wrote a note to Tony Minetti. The note explained that the stranger returning his Jeep was a cousin and asked him to turn over my Jag. I wrote another note to Hal Benson, my landlord, telling him to forward my clothes and stereo to an address in New York City. I wondered briefly what he would think of the three crisp hundred dollar bills I included in the envelope. Then it was out to the generator shack to kill the power for the last time.

Finally, it was time to go. The field agent pulled away from the cabin in the Jeep. Jane and I watched the red taillights out of sight before we turned and walked arm in arm toward the rectangle of blue light spilling from the shuttle's open hatch.

Suddenly the confusion, fear, and fatigue that had plagued me in the last twenty-four hours was gone. A feeling of exhilaration washed over me. It was the exhilaration of being alive and on the threshold of a great adventure; of being nine feet tall and covered with hair, and ready to buckle my swash from one end of paratime to the other; of having seen the future and discovering greatness lay there.

"I'm sorry I called you stupid," Jane said, snuggling close as we walked.

"You're not the first," I said. It was then that I stopped in my tracks. A funny thought had just hit me.

"What's the matter?" Jane asked.

"Your shuttle," I said with a chuckle.

"What about it?"

"I just realized. Joel Peterson was right! UFOs *are* ships from another universe." Then I laughed. What started as a chuckle built quickly into a belly jiggling guffaw. I laughed so hard tears began to run down my cheeks.

Suddenly Jane was laughing too.

When she'd managed to get control of herself, she wiped the tears from her eyes. "I don't know how to tell you this, Duncan. UFOs *really are* swamp gas! Or weather balloons, or airplane lights, or St. Elmo's fire. We shield our shuttles with aversion fields. They are practically invisible at night. There hasn't been a sighting of one of our ships in the whole five years we have been operating on this timeline."

I turned to stare at her. "Really?"

She nodded.

"Well I *will* be damned," I said.

Then we started to laugh again. This time the joke was even funnier. ■

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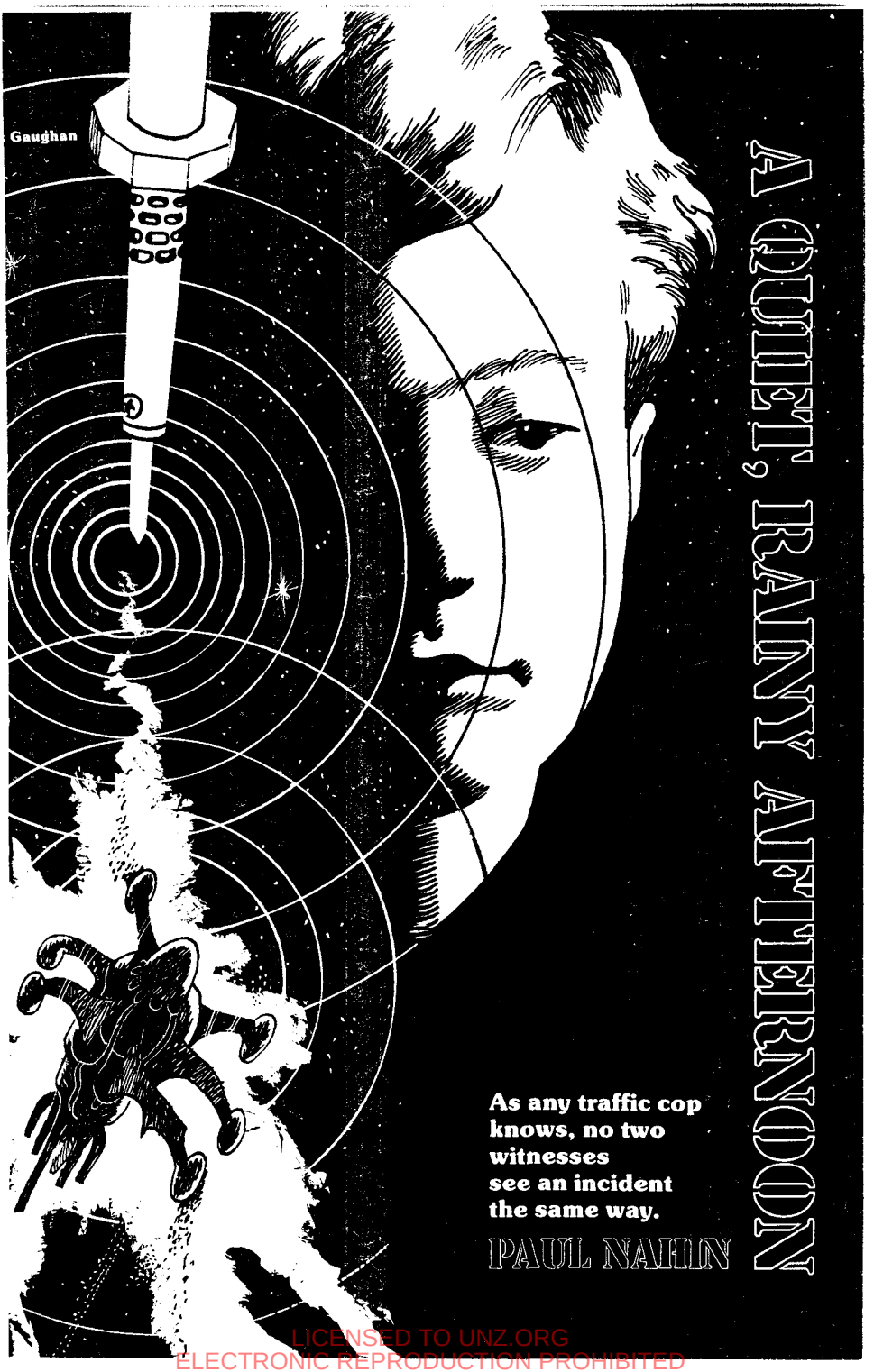

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Little Jackie Hawkins was one heck of a bright kid. He was also, like most small boys, a terror for his mother on rainy days. Trapped in the house with her son, Mrs. Hawkins' feelings for her offspring evolved from maternal love at eight a.m., to mild irritation by ten, to a fairly intense hatred as both hands on the clock pointed skyward.

"Jackie, *get out of the kitchen!* You've been in there eating every ten minutes, you'll spoil your appetite for dinner, and I'm not going to watch you waste good food tonight. You hear me, Jackie?"

"Ah, ma, there's nothin' else to do! Pete's gone with his folks to visit his aunt, Doug's got a cold, and Tom's mother won't let'm play 'till his ankle gets better."

"What's wrong with Tom?" Mrs. Hawkins was feeling frustrated. *The neighborhood kids all have other things to do when the weather is rotten,* she thought, *but on nice days when I'd like to have the house to myself, the whole darn bunch of them clamor from morning to night to come in and play with Jackie. Where are they when you need them!?*

"He sprained it when he fell out of a tree last week. He's really got a neat swelling on it!"

"Yes, I'll just bet he does," replied his mother, "and he's probably lucky he didn't break his silly neck. I ever catch *you* in a tree, Mr. Jackie Hawkins, and—"

"Yeah, I know, ma, I know. You *tell* me all the time!" Jackie came into the living room where his mother sat, an open book in her lap. With a mouth full of cookie fragments, his rhythmically churning jaws reminded Mrs. Hawkins of a cement mixer, and the noises emitted by her son didn't do anything to hurt the analogy.

"Don't you *dare* get crumbs on the rug—I just vacuumed in here!"

"Ah, ma, there's nothin' *to do*!" Jackie flopped down onto the sofa, and stared sullenly out the window. Rain fell with the fury only a good New England spring storm can have, and there was the high probability, as Jackie well knew, that it would rain the rest of the day, and all night, too.

"What about that new friend of yours, Raymond, isn't that his name?"

Jackie made a face. "Ray and me had a fight. We ain't friends any more."

"Ray and *I,* Jackie, not *me.* And don't use ain't. Your grammar is terrible. Now say it right."

"Ah, ma—Ray and *I.* I'm goin' downstairs and watch TV!" With that, Jackie slouched off the sofa and, as his mother watched with relief, he disappeared down the stairs into the basement game and TV room.

Jackie didn't really want to watch TV, but things *were* pretty dull. He flipped it on, plopped down on the floor, and gazed unhappily at the screen. It was just dumb old cartoons! He started to reach for the channel selector when the horizontal sync generator took that instant as the best time to blow its 15.75 kilohertz

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oscillator. The unsynchronized scan lines made a blotchy colored mess on the twenty-five inch display.

Any other boy on Jackie's block, or in the whole town, for that matter, would have just turned the set off in disgust. But not Jackie. He was a heck of a bright kid, and not one to be intimidated by a lack of specialized knowledge. As he watched the kaleidoscopic patterns of dazzling colors, he knew what he could do to pass the boring day. He'd fix the color TV.

He craftily noted that as long as he was reasonably quiet, and responded instantly to any inquiry from his mother, she'd probably not investigate. That'd give him almost four hours until his dad came home from work. Why, that'd be *plenty* of time to fix something simple like a color television set! He turned the power off, and pulled the set away from the wall. He was ready to start.

Intelligent lad that he was, Jackie immediately pulled the power plug out of the wall. He knew better than to fool around with the power still capable of zapping him. Then he tiptoed up the stairs, and cautiously peeked around the corner into the living room. Mrs. Hawkins was deeply engrossed in her book, and her reading glasses were already slipping down her nose. Jackie knew his mother would soon be asleep. It was perfect.

Quietly, very quietly, he turned back down the hallway, to the combination closet/tool area his father kept. Jackie looked briefly at the neat, well-stocked shelves, and then selected two screwdrivers (flathead and philips), wire-cutters, needle-nose pliers, a role of rosin-core solder, and the 125-watt soldering gun. His arms cradling the loot carefully, he again tip-toed his way back downstairs to his electronic patient, ready to begin surgery.

Removing the plastic back cover, he gazed at the maze of solid-state electronics, wire-cables, and complicated mechanical linkages from the tuner switch to the AM video and FM audio circuitry. It bothered him not a bit. He'd heard his father say, many times, when confronted with balky electronic appliances," Ninty-nine times out of a hundred, Jackie, the problem is caused by a bad connection. Just check all the contacts, clean 'em up, and that usually does it!"

Jackie pulled all the integrated circuit chips out of their sockets, and very carefully scraped each pin with a screwdriver blade. Then he put them back—all in the wrong sockets. It wasn't hard to do—after all, a three-stage Butterworth filter chip *does* look a heck of a lot like one with ten cascaded operational amplifiers on it.

Then Jackie plugged the soldering gun in, and reheated all the exposed solder joints on the tuner, just to be sure there weren't any cold joints. He didn't know what a cold joint was, or even comprehend the nature of a broken circuit, but he'd heard his dad talk about those, too. So he touched the gun tip to every joint he saw, adding generous globs of fresh solder for good measure. And the

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molten metal on at least ten of the joints flowed enough to short-out with each other. Some *very* peculiar circuits were thus created.

Finally, just to be sure there were no problems with the antenna, he unscrewed connectors to the 300-ohm lead-in wires and polished their contacts. Then he put them back—with one half of the antenna on the correct terminal, and the other connector to the normally unused UHF 75-ohm terminal. This set-up the electrical geometry for some mighty curious standing wave patterns in the antenna circuits, but, of course, Jackie wasn't the least bit concerned. He hadn't even *heard* of a standing wave.

Satisfied with his work, Jackie screwed the back cover on, plugged the power cord in, pushed the set back against the wall, and flipped the power switch on. It had taken him some time for all these corrective actions, and his father would be home soon. He had to hurry.

It's too bad the top physicists and electrical engineers in the country weren't there. Then they would have seen the first Mosaki Sub-Space Quantum Modulator in operation, two hundred and thirty-two years before Philip Mosaki rediscovered it. Yes, *rediscovered,* because by an incredibly amazing series of accidents, that's what Jackie Hawkins had turned the color television into. And a good thing he had, too.

For just at that instant, the Vodarian battle cruiser NEBUTRON came out of faster-than-light hyperspace, shifted over from its Mirchlen neutrino drive to the sub-light photon units, and went into a polar orbit 72,000 miles above the Earth. Sent by the Vodarian Space Council to observe the activity of all (if any) intelligent life in advance preparation for invasion, the Vodarians were met by a startling surprise.

"Supreme Commander, the sub-space sensors are recording an unusually high quantum modulation level! Previous robotic surveillance of this star system indicated no such technologically sophisticated life forms present. The master computer must have a data recording error."

"Hmmm," burbled the Supreme Commander, "to proceed with our pre-invasion orders, in view of this new knowledge, *could* be dangerous. What do you suggest, Squamus?" The Supreme Commander's aid was, as are all Vodarians, very cautious.

"I suggest, Supreme Commander, that we tentatively probe their quantum modulation field. If we can cause an appreciable breaking of the phase-lock amplitude, then we are more advanced. If, on the other tentacle, their phase-lock can*not* be broken, we should withdraw immediately!"

The Supreme Commander had won seven battle stars by following the advice of his aide. No reason now to break the chain of luck. "Proceed, Squamus."

Turning to the battle cruiser's control center, the aid projected the orders by mind thought—his wishes were carried out immediately by the

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NEBUTRON. But young Jackie Hawkins had done his work well. The phase-lock tracking sub-system he had created in the TV set modulator would have swelled Philip Mosaki's heart with pleasure—if he had been there. But, of course, he wasn't, since his great-great-grandparents hadn't been born yet! Even as the Vodarian sub-space prober probed and prodded, Jackie's modulator counter-probed and counter-prodded with hardly a miss of a hertz in frequency.

Back on Earth, Jackie was perplexed. The screen was *really* messed-up now, and there were strange burbling sounds coming out of the speaker. Boy, was dad going to be mad! For the first time, Jackie began to have self-doubts. He was, after all, just a small boy. Scared of what his father was going to say, Jackie scooped up the tools and ran upstairs to put everything back in the closet, all neat and proper. But he wasn't fast enough—his dad came through the breezeway door with a booming "Hi, everybody, I'm home. Boy, is it dumping out there!" Jackie rushed into the kitchen to keep his father away from the basement stairs.

"Hey, Jackie, how's my boy? Do anything interesting today?"

"Na, nothin' really, dad. Just took it sorta easy." Jackie prayed his father would stay out of the basement until, he could get back down there. He had left the television on, with the screen all crazy and making strange, really weird noises.

"Where's your mother, son?"

"In the living room. Say dad, let's go in and see ma. I'll bet she'll be real glad to see you!"

Mr. Hawkins looked startled at this suggestion—Jackie was at the age where little boys don't usually desire to have conversations with parents, with the exception of a short demand, once a week, for their allowance. He walked to the entrance of the living room, and saw his wife sound asleep, her book on the floor and her glasses in her lap.

"No. let's let your mother sleep, Jackie. She's had a tiring day, too, I'm sure." Mr. Hawkins *was* a thoughtful man. "Come on, son, let's go downstairs and play a game of ping-pong. I'll spot you five points!"

"But dad—" and then Jackie resigned himself to the inevitable. His father was gone, disappeared down the stairs. Jackie glumly started down to meet this fate.

"Oh, my—oh my God! What the heck is *this*!" Jackie didn't need to guess what his father was yelling about. But as he came into the room behind Mr. Hawkins, his eyes widened in amazement too.

The television set was no longer merely flashing pretty colors and making burbling sounds. It was glowing with a dull red-purple halo, while seemingly fading in and out in substance. First Jackie *thought* he could see the back wall of the room through the set, and then the set would become solid again. And then it would *appear* to fade again, the cycle repeating once every five seconds or so. What had

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happened, as would be theoretically derived by Philip Mosaki in a couple of hundred plus years, was that the third and fifth harmonics of the subspace quantum field were resonating in a coupled energy input mode. A most dangerous mode, too, one that would serve as the basis for the deadly Mosaki ripping beam, standard armament on all Earth star ships of the late twenty-second century.

So it was, therefore, that even as Jackie and his dad watched in horror and fascination at the strange antics of their television set, the NEBUTRON found itself in a battle for survival. "*Supreme Commander,*" burbled Squamus in fear, "the aliens are attacking! Their matter disruption beam is incredibly intense, the ship's defense shields are being inexorably torn to shreds. We *must* retreat!"

"Hmmm," burbled the Supreme Commander, but before he could continue, the left photon thruster tube of the NEBUTRON was yanked off and dissolved into a rapidly expanding mist of vaporized metal. That was enough to decide the issue. "Squamus. GET OUR ZLOBS OUTA HERE!"

But it wasn't to be that easy. The resonating fields of gigantic quantum gradients were now quickly dismembering the NEBUTRON. The battle cruiser just made it back into hyperspace before the last Mirchlen neutrino drive generator fused, but not before it was most severely damaged. All the way back to Vodar the NEBUTRON randomly flicked out of hyperspace for brief moments, each time loosing huge quantities of hull material in collisions with cosmic dust. By the time they reached Vodar, the hull was only one tenth its original thickness, and the NEBUTRON had a noticeable sag in its profile. In addition, her crew was sterile. Hit with the hard radiation generated by the hull interactions with ordinary space at hyperspace velocity, they would produce no new little Vodarians.

The Space Council, naturally, had no recourse but to haul the Supreme Commander up on a general court martial for bringing a battle cruiser back in shabby condition, with an infertile crew. There was no possible defense. So they busted his zlob right out of the space service. And they canceled the invasion of Earth. Vodarians *are* cautious.

Meanwhile, moments after the NEBUTRON vanished into hyperspace, the Hawkins television set overloaded and blew every breaker in the service entry box to the house. The internal electronics of the set, so recently converted into a Mosaki Sub-Space Quantum Modulator, melted. As the future Philip Mosaki himself would discover, such an awesome physical phenomenon needs proper cooling, something Jackie hadn't provided. But, after all, he was a very small boy and didn't know any better.

"Well, I'll be blasted! I never saw anything like that! I'm going right down to Sears tomorrow and get a replacement—good thing the one year warranty is still in effect." Jackie's

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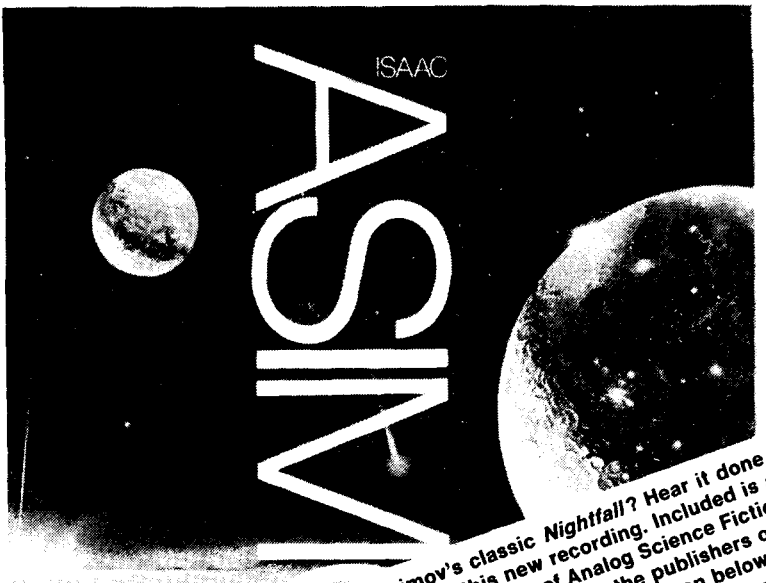
father looked puzzled, but to Jackie's profound gratitude, not a single suspicious glance came his way.

Later that night, just before he drifted off to sleep, Jackie thought with anticipation about the next day's weather forecast—received over the kitchen radio since the television was, of course, incapacitated. No rain! Boy!, tomorrow would be fun, not dull like today. On rainy days, there's just *nothin'* to do! ■



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REMODELING OF EVE

When making wishes, phrase very carefully . . .

LEE CORREY

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I like girls . . .

Big girls, little girls, fat girls, thin girls. Any kind of girl. Let's get that straight from the start. A space jock has to be healthy in both mind and body, and, although we have plenty of things to keep us busy on those long, lonely voyages, we're not celebate. As I told you, I like girls . . . and I'm typical.

Sure, there are some women in the space business. I've never shipped with a mixed crew, however. I've known many astronauttes, but I really can't say too much in their favor . . . even though I like girls and any *rendezvous and docking will suffice* under emergency conditions. But spaceflight isn't really a feminine gambit. After all, I ask you: what kind of girl leaves comfortable surroundings, spends years learning a very difficult and demanding technical nuts-and-bolts specialty, and then enjoys being crammed and jammed in a smelly tin can for weeks on end without a decent bathroom?

(The ships with married crews ship a different orbit, Mac. A whole different game. Same holds true of the macro-life ships with their closed ecologies.) I get my fill of hairy space jocks, so I like my women to be women.

But I've got a slight problem. I'm Mike Justinian, licensed communications officer, star grade. I mass less than sixty kilos. My nickname is derived from "micro." My small size is handy in a space can, but limits my selection of girls when I hit dirt.

And I definitely like girls . . . like I told you before.

But a space jock gets around. Over the years on lots of rocks, I've managed to accumulate an adequate but not affluent number of playmates while at the same time contributing to zero population growth.

Like I say, I'm typical except for size . . . although some comrades maintain I make up for it with increased drive. That's why joy abounded among the five-man crew of the *S.S. Prehoda* when the skipper announced we were boosting for Mohave on Earth.

I hadn't been on Earth in years. We'd touched down on Luna a couple of times in that period, and we'd even docked with a couple of NEO stations up near the top of that gravity well. But rarely Earth. Earth is a very expensive place to land. Also not much business there since industry moved out into Near-Earth-Orbit where the NEO power plants sop up the energy from our friendly neighborhood fusion reactor, Sol. What do you ship to a garden planet?

Answer: gems.

So we were running very light, which would make it easier to get in and out of that gravity well. There was also a penalty clause in the contract concerning late delivery. That was great, too. We boosted at higher G, and that got us acclimated to Earth's standard-G field. And the faster we got to that fabulous paradise, the happier we'd all be!

Earth! Lovely water-covered

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planet, warm and embracing, softly beautiful with its high peaks and verdant valleys. . . The womb of mankind. No wonder she is called Mother Earth.

And no wonder she is better off and more beautiful now that she is no longer pregnant with the human race . . .

Well, I could really care less about geography and philosophy. And I wasn't a botanist. What I really wanted to see were the girls.

The stories had gotten around. I didn't believe them. I wanted to see for myself. Some of the things I had seen on Earth-origin video were rather bizarre, but I guess that the women on video have always been somewhat exaggerated because of some indefinable transmission garble (probably in the eye of the viewer) that stretches out the horizontal axis. Video couldn't tell the whole story about bio-cosmetics.

I don't think anyone figured that bio-cosmetics would have more impact on women than the legendary Pill.

But bio-cosmetics could give women what they wanted . . . for real. For centuries, they'd been enduring the often unsatisfactory temporary improvements of classical cosmetics —essentially greasepaint and padding. When the Earth girls got hold of bio-cos, they went the whole route.

Some of the women of Earth were literally remaking themselves . . . All the way, buddy!

But it had been happening where I wasn't. I was born and raised in the frontier culture of out-planet where we do the best we can with what we've got . . . and what we've got in the way of girls is satisfactory although not always luxuriously libidinous. I can't complain about our off-planet women. They are great in their natural state. But I was encouraged in my curiosity in my tender youth, and so I was naturally curious about these new women of Earth.

I had to see it. Sometimes we don't get enough variety of sensory inputs going from rock to rock.

But one must always try to start from good baseline data. To break into things properly, one must have proper contacts. I don't carry an address book around, not when I have unlimited access to the big computer that sits in Drawer Five above my comm post. No girl likes to think that she can be reduced to a series of digital pulses, but I had done it that way. I could call up any sort of data I needed when planning to go dirtside in or on any rock in the System.

So I hit the input panel with MIKE PROG PM SOCAL PRINT GO.

I hadn't operated extensively in SoCal, so I got only one read-out on the hard copy. "Gigo," I managed to mutter as I studied it. But I hoped not.

Her name was Evelyn. The physical parameters didn't ring bells, so I called for a video playback. Then I remembered as her image synched on the screen. A red-head, not bad shape, lacking a little on the top side, fewer third-order curves than optimum,

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somewhat heavy legs and ankles. Typical facial features of the red-headed sub-race: high, thin cheek bones, largish nose, greenish eyes. A feminine George Washington. But very feminine according to the hard copy on characteristics and somewhat softer copy that came from my own memory banks. Terrific ambition and drive. Strong likes, dislikes, desires. Good dancer. Great party type. But somewhat hair-trigger with a temper that was something to be observed rather than received. Creative, as you'd expect from a wardrobe designer who worked in and moved with the super-savvy and hyper-sophisticated SoCal entertainment complex.

Well, an old nuts-and-bolts space type like me couldn't have everything (although we tried). Evelyn was no queen, and she blew hot and cold. I mentally shrugged, pocketed the hard copy, cleared the read-out, went back to work, and mulled it over as we boosted toward Earth.

I couldn't make up my mind. Evelyn? Or try hunting? My dilemma was solved when the *Prehoda's* chief engineer, Karl Hansen, asked me about my plans for SoCal.

I told him I had something in mind, more or less, but that she tended to be a virago.

"Don't skew about her," he told me with a toothy grin . . . which changed to a lecherous leer. "There are lots of gals in SoCal. It's the best place on Earth . . . and Earth is loaded with women."

There was something in what he said. In the terrestrial megacultures, women outnumbered the men, a trend that had started in the 20th century. According to some data I'd seen, there were more than 10% more women than men in North America. Men still held the edge in the rougher, evolving parts of Earth, and men predominated in space. I am told that frontiers have always been this way. But Earth no longer needed the women's liberation movement.

"Remember Anton Young?" Karl asked. When I looked blank, he went on, "Oh, sure you do! Used to smoke the milk run from NEO to Luna for TransPlanet?"

I recalled him then. "Wasn't he in the *Kreuger* two years ago when it dinged NEO-Pacific Geostationary?"

Karl pulled a rumpled hard copy from his pocket. "Got a message from him before we boosted out of Ceres. I'd queried him from there, and he invited me to a big blast for some of his customers out at his place. Said to bring a friend. Are you a friend today?"

"Something doesn't track. Didn't Anton lose a few parts when the *Kreuger* kissed NEO-Pacific?"

"Bio gang patched him up and then overhauled him to his own specs." Karl shook his head in envy. "Big ape managed to buy his farm and live. Used the settlement cash to put himself in business. 'Exporting entertainment,' he sez."

"That sounds unreal. What kind of entertainment can be exported off-

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Earth?" I wanted to know. "Video stuff's been locked up by syndicates for years . . . and most rocks consider live entertainers to be too much drain on their ecologies. What . . .?"

Karl handed me the hard copy. "Read it. He says he's got something new and that we'll see it at the party. Claims it's better than live stuff." He leered again. "If I know Anton, he'll have the live stuff there, too."

"Me heap-big friend," I told him. If I couldn't make rendezvous and docking at Anton's, I could always call Evelyn.

If you've never been on Earth, you have no idea how jam-packed its population centers are even with the regulation 2 persons per hectare density maximum. Mohave is out in the middle of nowhere because spacecraft require slips, shops, warehouses, sky docks, and other facilities that take up space. In Los Angeles, there wasn't a square meter to land on . . . and certainly no space for port facilities.

I didn't recognize anything. Four years had passed since I'd hit Mohave, and everything had changed. The planet Earth is never finished; people are always tearing down something to put something else in its place . . . and on Earth that happens *fast.* They've got matter to play with and energy to manipulate it. Ever know a gardener who didn't putter?

Karl and I grabbed an aircab, and air traffic control swung us out over the Pacific Ocean north of Santa Barbara to bring us in to Anton's place near Oxnard.

Sorry, but I still consider the Pacific Ocean impossible. There *can't* be that much free water in one place! If it wasn't at the bottom of that damned steep gravity well, it would make life a lot easier on a lot of rocks out there . . . and Earth wouldn't miss a drop of it.

Anton Young's place was built out over the ocean so that the waves rolled in underneath it. I wanted to get inside that house in the worst way. I am just not used to standing *outside* with nothing on. It's unnatural! I felt a lot better after we had gotten into the foyer of the house.

A great big, strapping hunk of man charged up to us. His evening garb did nothing to hide the fact that his was built like Michaelangelo's *David,* only more so. His face was vaguely familiar. "Karl! Good you could make it! And from the depths of space, it's *Mike*!"

"Hi-hi, Anton!" Karl exchanged greetings with him and jerked a thumb at me. "You oughta know Mike would never turn down a low-perigee boost like this one of yours."

"Mike, you look great! You haven't grown a millimeter, have you?" Once a spaceman, always a spaceman, and we don't take small insults seriously between comrades out there . . . or down here later. Besides, even if it hadn't been for the deep gravity field, my instincts knew better than to tangle with a guy built like a brick recycler.

"No, but you've changed a tad," I told him as I slapped him on the

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shoulder. It was like hitting a granite boulder.

"Yeah, some things have been changed. The boys did a pretty good job." Anton flexed his arm. I watched with fascination as the muscles rippled. In space, Anton had never had rippling muscles; he's been just as scrawny and hard as the rest of us. "But the real changes are inside where you can't see them," be bragged. I guess he could afford to. "Nature's engineering was always a sloppy sort of trial-and-error, but who needs it now? Come on in and meet the people!" Grabbing us both by the arm—there was no doubt that those muscles were real—he led us into the sprawling room.

The place was full of people. Anton began to introduce us around. And I began to feel pretty ratty even in my best jump suit . . . although my attire marked me for my profession right from the start. I discovered that I needed *some* badge of achievement to boost my ego, because I was totally stunned by the people I met.

Some of the people were downright beautiful, and others were—well, perhaps grotesque is the best word for it. Some of the men were like Greek gods so perfect in every line that you'd swear they were statues come to life. There were also some rugged individualists who had exercised their free. choice and expression to the limit; they were almost caricature.

It was the women that put me in a state of semishock.

They weren't as exaggerated as the video I'd seen out-planet. But in the flesh they were much more startling.

Did you ever know a woman who was satisfied with the basic natural equipment she had? That's true anywhere, but the women at Anton's had done something about it. They'd changed themselves to suit their own desired self-image . . . or for the benefit of their hunting in a world where they outnumbered the available men. I was out of practice, so I couldn't even begin to guess at some of the measurements. They had more of it here . . . and less of it there . . . and it was all real . . . and they didn't look disfigured. The bio-cosmeticians who'd done that work had been real artists in their own right.

Someone stuffed my hands full of things to eat and drink. The place was downright unreal. I did my best to act in a sophisticated fashion, but I became damned uncomfortable. Something kept telling me that this was 'way out of my field and moved faster than I could boost. I'm pretty pan-cultural out yonder, but that wasn't SoCal in Century-21.

Yet these beautiful, moving, living sculptures were real people. And some of them tried very hard to put me at ease. No matter how hard I tried, I found it very difficult to concentrate on a conversation without staring.

It was also difficult not to notice the fact that the women began to congregate about Karl and myself. I couldn't figure out what attracted them to a couple of runty space jocks. Was it just because we were different?

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Were they looking for variety? I received an invitation from one of them, but it was so clever and veiled that it went right past me at the time.

Anton finally dragged me away from a group. Literally. I had no choice but to go with him. He looked down at me with a sly grin and asked, "Mike, do you like girls?"

You already know my answer to that one.

"Then why aren't you making contact? Interested in any of the ones here? Just point her out to me."

It finally got through my thick skull that this was not just a friendly, social get-together. It was a business party. And Anton wasn't skimping on any sort of hospitality. "I. . .I guess they're just a little bit too fantastic, Anton."

He guffawed. "I thought so! Comrade, you need a little education first! Come on and I'll show you the gadget I'm going to unveil later on." He stalked out of the room and I followed. As he strode through the halls, he continued, "This is going to change the whole entertainment field. It'll be just the thing for you guys out there. Beats the hell out of anything else. Women are just women. Whether they've been bio-ed or not, they still have their faults. But this doesn't." He led me into a study. On a table next to a reclining couch was a collection of electronic gadgetry replete with controls, tape cartridges, and a collage of microelectrodes. "Openly, there will be the usual run of tapes, including family stuff. But for certain special markets, I've got special tapes from Moscow, Paris, Teheran . . . We'll have quite a library to choose from. Come on, lie dow and get educated!"

I held up my hand. "Don't boost me too hard, Anton. What is this gadget?"

"The real thing, only better. Sight, sound, touch, the whole sensory spectrum coupled with appropriate commands to your nerve trunks and emotional centers. Real time, accelerated, or slow rate. Edited, dynamic range boosted, preemphasis where needed . . . Well, to hell with the technology. I've taped some of the best stuff in the world. Who needs a real woman? I'm getting the best ones on tape, Mike . . ."

Electronics is part of my profession, and a lot of us had wondered why this hadn't been done before. To discover it as a reality produced a future shock. But why not? The Coanda-Puharich-Flánagan technique of feeding sensory data into the brain through any available nerve trunk had been used for years to provide sight to the blind and hearing to the deaf. For decades they'd been using psycho-electronic techniques to control and trigger emotions.

I was suddenly cold sober. One taste of this device, and I might end up diving into my belly button contemplating its electronic Nirvana. I decided that I wasn't about to let this electronic prostitute titillate my neurons.

"Anton, thanks, but I prefer doing what comes naturally."

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"Try it. You'll like it! You can always push the panic button and come up for air!"

I began to get a little upset. "And this is what you're going to market?"

"Damn right! People will buy it."

"Damn right, nothing! Damn lousy misuse of technology, Anton!"

He shrugged. "I'm only going to make and sell it. I can't control what the purchaser does with it. If the buyer wants electro-pornography, I'd rather sell him high-quality recordings than force him to buy substandard stuff at jacked-up prices in an underground market."

The steam was probably starting to come out of my ears by now. "What about the people who are going to blow their minds on this thing?"

"Mike, your out-planet virtue slays me! Didn't you once tell me that every man deserves the right to choose his own form of poison? The weak ones who can't control themselves with this thing will go down the drain; they won't breed and their weak genes will be removed from the gene pool in a couple of generations. Don't get self-righteous with me, buddy!"

Obviously, he thought he was doing the human race a favor. Looking back on it, maybe he was right after all. I didn't think so then. I decided to get out of there. This wasn't my way of living *or* of letting off pressure. I needed something more familiar, but how was I going to find it in this pressure-cooker culture of SoCal-21? I didn't even know my way around the place.

The hard copy was still in my pocket. I got on a phone and called Evelyn.

Her number hadn't changed. Nobody's number ever changes on Earth. And she was at her phone. "Mike!" her voice squealed. "Oh, Mike, you're back! I thought you'd never come back!"

She didn't turn on her video, so we went through the old bit of "how are you," and "you sound great." Then I got down to the meat of the matter. No, she wasn't busy tonight. Yes, she'd love to see me. She gave me her new address, and I told her I'd be there as soon as I could.

The party was still in full stride, but I couldn't find Anton or Karl. Well, Karl didn't need me around; he knew how to take care of himself. I'd call Anton tomorrow and thank him for his hospitality.

Evelyn's apartment was in one of those modular sky complexes that rose like an angular tree for a thousand meters over the San Fernando Valley. The aircab got confused among the ramps, levels, balconies, cupolas, and portals. I finally signalled trouble, and a police cruiser put me on course.

As I walked up the ramp to the door of Evelyn's module, I found myself hyperventilating again in this incredibly thick atmosphere . . . but I had to admit that Earth was a pretty place to live if you could stand being out in the open. The valley sparkled with the lights of other towers and complexes. Evelyn's work in professional entertainment wardrobe design

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must be paying well because this was certainly no low-income location. Well, why shouldn't the entertainment arts prosper on a garden planet? Who wants to be bored with his leisure? The world cried, "Entertain me!" And the artist and the scientist responded. And why not?

I pushed the annunciator, and Evelyn's voice came through the speaker grille, "Mike?" I agreed that it was me. "Come in. The door is open."

Yes, she did have a plush place to live, I told myself as my eyes began to adjust to the lighting. But I didn't have time to admire the setting. I was set upon by a lithe, warm, soft, wiggling female. "Oh, Mike, am I glad to see you!" Being hyperventilated on the occasion, I didn't have to come up for air for quite some time, so I was able to give the kiss all of the attention it deserved . . . and it deserved plenty.

Then I realized that the woman I was holding did not match the data that I had on Evelyn. I stepped back and held her at arm's length to look at her.

"Yes, Mike it's me," she said, sensing the question in my eyes.

The plain white leotard did not conceal the fact that there had been some major changes made.

She was small, as I had remembered her. Otherwise, I would have to completely revise all of my data about her. And I didn't know if the *Prehoda's* computer could be programmed to handle fourth-order curves. Although the rest of her was different, she still had her high cheekbones, but now there was a small, pert nose and a full mouth. This face—Evelyn's face retouched by a master sculptor—was framed in a thick mane of fire-red hair. It emphasized the rest of her . . . and that didn't need emphasis.

"Is it really you, Evelyn?" I managed to ask. Too many shocks in one day.

"No, it's no longer Evelyn. I'm Eve now." She turned slowly in front of me as though she were doing nothing more than showing off a new dress for my approval. "Do you like it, Mike? It's the very best. I went out to Fontana to the bio-techs our studio uses. They've done some of the top actresses . . ."

It took me a few moments to find words. "Do you like it?"

"I'm what I wanted to be."

Yes, that was probably true. "I see Evelyn become Eve. I'll try to get used to it."

"I'll try to help you. Do you like what you see?"

"Am I restricted to just looking?"

"I'm more than just a manikin," she replied and proceeded to prove it.

Whatever had been done to her—or whatever she had had done to her—had made her physically more woman. Initially, it seemed to be an improvement. She was not—repeat, *not*—the Evelyn I had known.

Later—my syncopated circadian rhythm doesn't match Earth's illogical twenty-four-hour cycle—as we sat relaxing in each other's company, I was able to frame the question and

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ask, "Eve, why did you do this to yourself? I admit that the changes improved things, but was it really necessary?"

For a moment, I was afraid that I'd said the wrong thing and triggered the temper. I seemed to detect just the most fleeting indication of it, but Eve looked up and reacted like an automatic device suddenly restabilizing itself. "Are you kidding?" she blurted out, then gained control again. "No, of course you're not. Mike, you don't live on this world. You and your kind got out to find something better; the rest of us had to try to repair the damage here. I don't know whether we did or not, but those who know say it's better than before. Still, you live differently. You've got no idea of what it takes to live here . . ."

"Nuts! People are the same no matter where they are!"

"Not true, I'm afraid. You're a man living and working in completely alien surroundings. Here, in SoCal on Earth, I had a choice. I could live a lonely, unnoticed, sterile existence . . . Or I could compete for what little love and affection there are in this world." Eve was struggling with herself. I could sense it, and I could feel that there was more boiling beneath the surface than was coming to light. She moved to the window and stood shining in the bright, clear SoCal sunlight. Was she really fighting that hard with herself? And why? She went on in a voice so low that I could barely hear her. "Once upon a time, what a girl lacked in physical attributes she could offset with personality. I tried that approach because I had to. I really tried hard. But I was short-changed in that department, too. And I hated myself because of it!" Her voice rose. Control was still there, but it had slipped a little bit. "I hated myself, Mike! Every time I looked in the mirror! I hated the body I had to live in! I hated what it did to me! There I was, surrounded by beautiful people, and I hung beautiful clothes on them to make them more beautiful, and as I made them more beautiful I became less . . ."

"Eve, there's nothing wrong or shameful about the perfection of the human body."

"That's a fine sentiment if you have something to be proud of to begin with." Her voice dropped, and her gaze also dropped to her hands. "As to the perfection of the human body, ask any woman about that . . . any woman. She'll give you a long list of faults she'd like eliminated . . ."

She shuddered, then whirled on me, tearing my hand off her arm. "Mike, I'm surprised at you!" she snapped. Now her voice was rising. "Of all the people I have ever known, I expected that you'd understand . . . that you were enough of a real, honest human being to empathize . . . and that's why I love you, Mike. But now you come and ask these stupid questions about what I did and why I had to do it . . . and I don't think you understand anymore!" She began to tremble, and

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her beautiful face was contorting into a mask of tearing anger. "What's the matter? Don't you like me now? Are you afraid to hurt my feelings by saying that you don't like what I did? Do you want me to be something else? Don't you like this? Do you know what it cost me . . . and the time and trouble and hurt . . . What the hell do you men really want?" This last was almost a scream.

The color suddenly drained from her. The anger faded from her face, and her eyes lost focus on me and looked beyond. With a choking noise in her throat, she literally relaxed completely in front of me and melted to the floor.

I tried to catch her, but I was not used to catching limp bodies in a standard-G field.

What had happened? Almost by instinct, I checked vital signs . . . shallow breathing . . . fluttery, weak pulse . . . cold, clammy hands . . . shock; pure and simple. But under conditions that scared the hell out of me. Shock, from just losing her temper? My God, had the bio-cosmetics people goofed?

I tossed a furry throw rug over her, jacked her feet up on a couple of pillows, and got on the phone. "Emergency! Get an ambulance here!"

When I picked her up at the biotechnology center in Fontana two days later, it was as though nothing had happened. And nobody would tell me, either. Privileged information, I was told. Eve acted like it hadn't happened at all . . . Maybe she simply didn't remember. At least, she acted that way. Or she just wouldn't tell me. "Oh, Mike, forget it! Let's enjoy each other while we can!"

The next two weeks were perhaps the most idyllic I've known before or since. With Eve, I sampled the incredible world of Century-21 America in SoCal. It was perhaps the closest thing to the old Irish paradise, Tir na nog, the Land of Youth, ever to come into being. It's gone now, of course, because every living organism—be it individual, cell, or culture—grows up and matures. But it was a mad, crazy, confused, searching, raging, rushing, frantic world in violent transition. People could do anything they wanted to do if they were willing to pay for it.

In this incredible environment, Eve and I still found a measure of privacy and intimacy impossible to know in my out-planet universe.

I remembered what the *Prehoda's* computer had said about Evelyn. Physically and emotionally, Eve wasn't the same woman. Sometimes, she was like a double image on video. Evelyn was still there, but Eve was superimposed upon her.

It was confusing to me. I never got used to it. I don't really understand why Eve didn't react to it, too. I think she did. I detected a sort of—well, a sort of sadness gently underlying the personality that was now Eve.

I shouldn't have done it, but I began to fall in love with her. I guess there were a lot of reasons for it. But it had only one possible outcome. This

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was the real world, and I couldn't duck the consequences. But I didn't want to think about it until I had to.

It did not come to the surface openly until we were engaged in a long and tender rhapsody prior to my inevitable departure for Mohave, the *Prehoda,* and the sky. We were quietly holding each other and cherishing each instant when Eve whispered, "Mike, take me with you."

I came up out of a wash of gentle bliss feeling as though the room had decompressed explosively. I'd been waiting for this moment, not really knowing how I'd handle it when it happened. I found myself saying, hoarsely, "Eve, there's no place for you out there."

She replied without hesitation, "Yes, there is, Mike. With you. As wife, mistress, or whatever you wish. I want you, Mike, any way you'll have me. *You,* Mike. Not these posturing supermen around us here." She rolled away and glanced at me. "Look at me, Mike. Don't you like . . ."

"You know damned good and well . . ." In addition to being a real doll, Eve was one of the few women I've known who were smaller than I am.

She ran her hands along her sides. "I'll never grow old on you, Mike. I'll be like this until what's inside of me wears out and stops . . . and then they can replace it."

It took a minute before I could tell her, "Eve, we don't have any bio-centers out there."

If she heard me, she didn't pay any attention to what I had said. "I could even bear your children, Mike. I'd have to have some special work done, but we could have children if that's what you want . . ."

I grabbed her shoulders, shook her hard, and looked directly into her eyes. "Eve, listen to me! We don't have any bio-centers out there . . ."

"But . . . they've got them everywhere. . . . Don't they?"

"Not off-planet, Eve. We literally can't afford them. Our medics have to be doctors . . . good mechanics, not engineers. We get banged up occasionally, as Anton Young did; he was lucky. He got to come back here and get reengineered. Most of us would be happy to get to any kind of saw-bones who'd be able to patch us up. Any sort of bio-cosmetics is out of the question out-planet . . . yet."

"But I can always come back here . . ."

I didn't really like what I was telling her. Yes, I probably loved her, and it hurt to do what I was doing. But her concept of the universe was so far removed from reality that she would have real trouble getting along out-planet. "Maybe. Maybe not. Suppose there isn't time? Would our medics have known what to do if you collapsed the way you did here a couple of weeks ago? I didn't even know what was wrong, Eve. I could only assume that you'd gone into some type of shock reaction . . ."

"It was only an empty implant injector," she tried to explain.

"Implant injector?"

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ONE LITTLE PLANET

SOVEREIGN

R. M. Meluch

In a universe where Earthmen and Uelsons battled for control of galaxies, what chance did Arana have for survival? But not only was this seemingly backward planet a fuel stop for space warriors—it harbored a new race of men, and the key to the ultimate struggle between mankind and man's most hated enemy...

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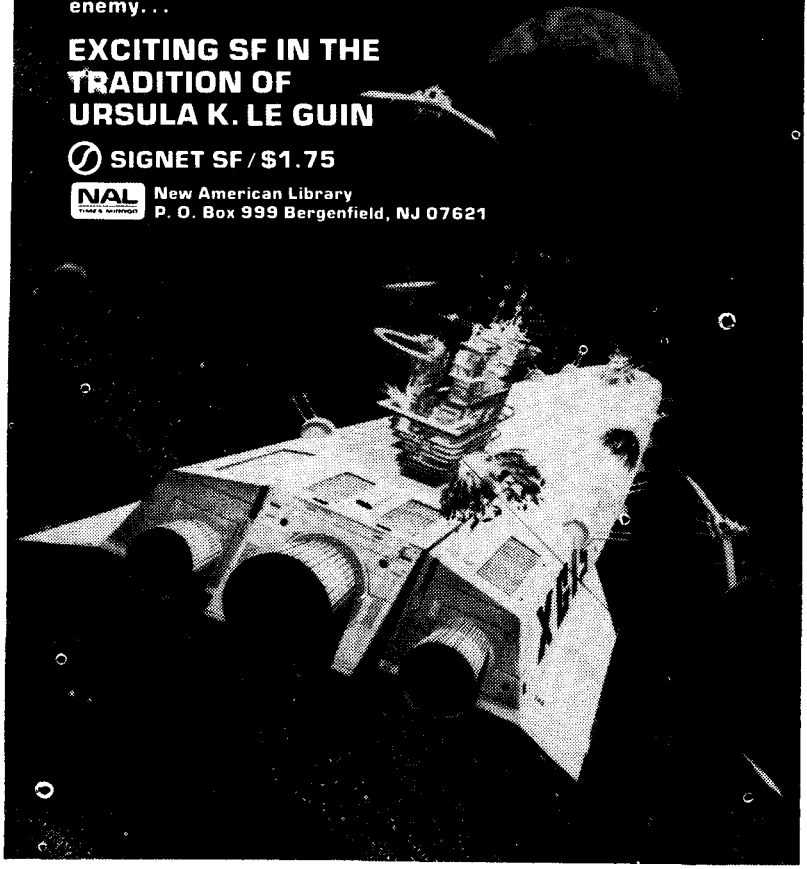

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"I . . . I used to have a terrible temper, Mike. Remember? I had them change it. They put in automatic injectors to level out my personality . . . To make me a nicer person to be with . . ."

I couldn't say anything. I was the one who was almost in shock at that point. My God, what they could do! And people wanted them to do it! And people here on Earth like Eve almost had to have it done to stay with the competition! Earth a paradise? Not for me! And not for Eve, either, if I could help it. There had to be a way . . . God knows what would happen here next when Anton's little gadget really got popular . . . as it certainly might.

"Eve, if you really want to go back out with me, I'll do everything I can. But you can't go out-planet like you are. How long would it take them out at Fontana to . . ."

"To remake me into a real woman again?" she finished for me. "Oh, Mike, I had too much changed! Everything inside is . . . new." She fell silent beside me, looking up at the ceiling. The ability to weep had not been taken from her. Tears began to trickle over her delicate cheekbones.

Neither of us spoke for a long time. What was there to say? What can you say when you're trapped in paradise?

Finally, Eve whispered, "Oh, Mike, this is such a stinking, lousy world! Why did I do it? Why did I go too far to change?"

I didn't reply. But I thought to myself, poor little toy. Eve had been remodeled. She'd gotten what she thought she wanted. But the bio-cosmeticians had forgotten one important fact about a woman: she always reserves the right to change her mind.

When the *Prehoda* boosted from Mohave for Mars, I didn't feel any better. I was ready to chuck the whole works. Over the chirp and chatter of departure communications, I watched the beautiful planet Earth fall away from us and found myself in a real brown study. I found myself asking, am I any different from poor, lovely Eve? By choice, was I just another Don Juan engaged in an eternal *wanderjahr,* spanning the black spaces where whatever is done is also a cry in the face of a hostile universe? I couldn't have my Eve. Was there any sense in really doing all of this? There had to be, but the reasons eluded me in the blackness of that tragedy.

But Karl Hansen was in great form. He came bounding in after we'd reduced boost to a half standard-G. "Boy, what a leave!" he bubbled and began to expound the lurid details. Then he stopped. "What's the matter, Mike? Didn't you make it back there?"

"I did all right, Karl."

"Great place, isn't it?"

"Depends."

He gave out with that familiar guffaw. "Hey, Mike, too rich for your blood, hey?"

"No, not really. But you've got to be careful what you ask for. You get it. All of it." ■

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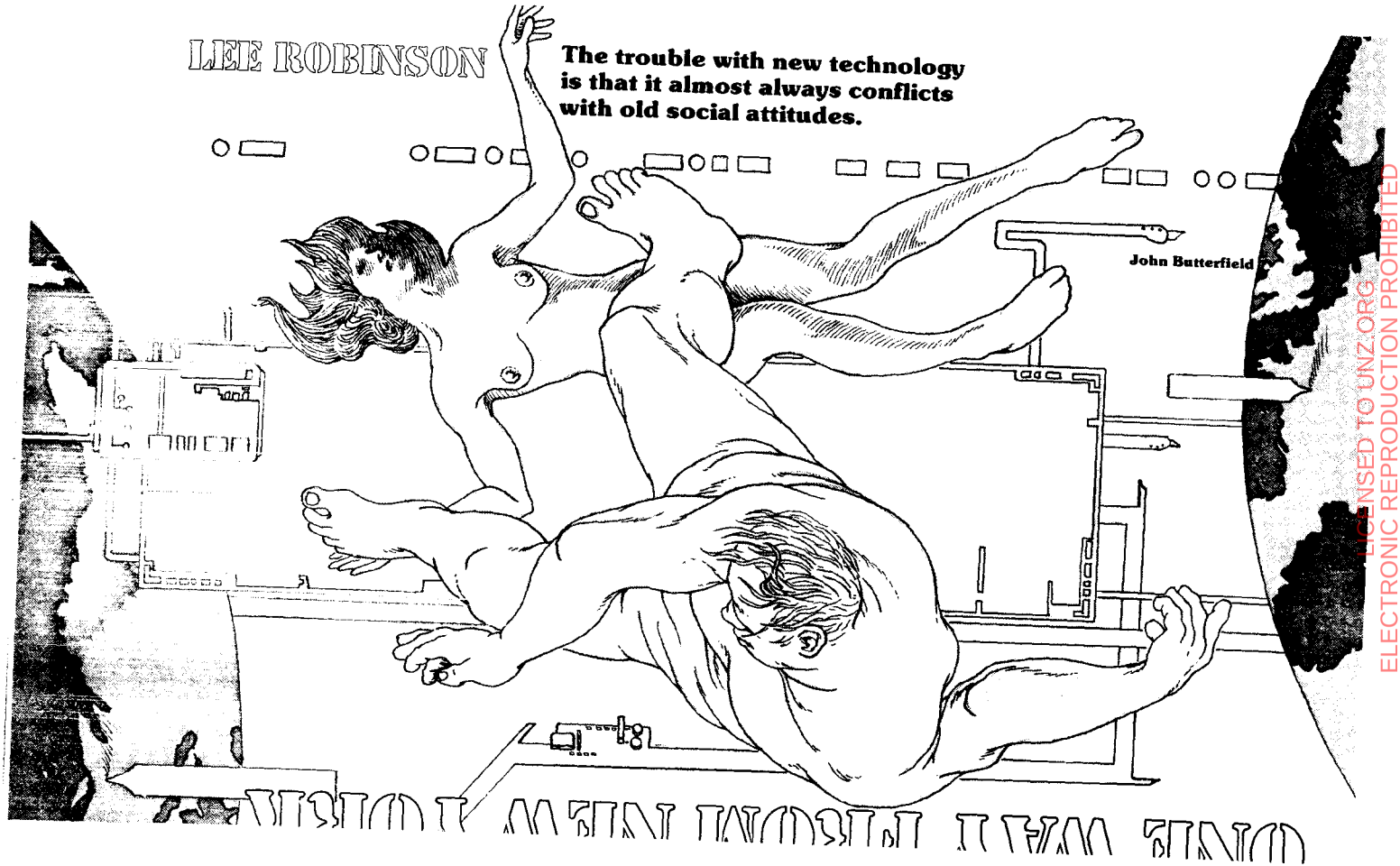
LEE ROBINSON
The trouble with new technology is that it almost always conflicts with old social attitudes.
John Butterfield

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It was impossible to completely ignore the open hatch in the floor, but Dutch avoided looking into it as he turned to the control panel mounted in the wall and pressed the button marked CLOSE AND DUMP. A moment later he heard the thunk as the hatch slid shut, then the hum of the lower door's opening and closing.

With an unconscious sigh that had become a part of his standard procedure, he put his mind back on work. He had successfully projected a passenger from New York to Tokyo, and there were others waiting.

"Let's see you run that reset sequence, Wheeler," he said to the trainee at the computer terminal. "And use that check list. The last thing we need is creativity."

Wheeler's red jump suit marked him as not yet worthy of the white's Dutch wore. Still, Dutch had no real reason to treat him like an incompetent, and he felt a twinge of guilt. For some reason they provoked each other. Dutch had labelled it bad chemistry, for lack of real understanding.

Now he was following Dutch's orders meticulously, one hand following the sequence in the operations manual, the other hunting-and-pecking response to the queries on the screen. With maddening caution he cross-checked each answer between screen and manual before finally pressing the enter key.

"Damn it, Wheeler, they'll be stacking up in the waiting lounge. Let's go!"

"Almost done."

Dutch turned to the massive table that stood tilted in front of the hatch, the foot almost touching the floor. Behind him he could hear Wheeler's speed pick up as soon as he wasn't looking over his shoulder.

A casual visitor may have thought the room was used for taking x-rays—if a casual visitor were ever allowed near it. The scanning head hung over the table, its anodized aluminum and dark blue panels relieved on one side by a panel of lights and small dials, and on the bottom by the dull gray plastic through which the scan beams focussed down on the table.

Dutch reached over to the small control panel set into the edge of the table and flipped a switch. There was the slightest hum of a small electric motor somewhere deep in the pedestal and the foot swung up from the hatch. With a glance over his shoulder he saw that Wheeler was indeed about to finish the routine. He stepped back to the control panel in the wall and hit the EXCHANGE switch.

The opposite wall parted to reveal a twin to the table he'd just levelled. They barely missed as they passed on parallel tracks set into the floor—one leaving empty, the other rolling into the room carrying the next passenger. The scheme was part of the elaborate precautions taken to keep even the prep technicians from learning the procedure in the projection room.

Dutch stood fascinated by the passenger moving silently toward him, deep in a prep-room sleep.

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Young female passengers were rare. Most of the customers were high-level executives or jaded jet-setters trying to outspend their social competitors. Dutch thought of them as petty people, shallow despite their material success, and uncaring predators on those less aggressive than themselves. As long as he saw them that way he could keep doing this job that was gradually making him rich, and steadily making him drink too much and sleep too little.

The girl's white dress and the standard white elastic cap that held her hair close against her head gave a look of purity to the clear innocence of her face. She was about eighteen, and he felt himself grow a little older when he realized that he thought of her as a child.

If the expansion plan were successful Dutch could expect to project thousands like her, thousands that he couldn't be indifferent to, because it was getting tougher every day, even with the human sharks.

Wheeler was part of the expansion —one of fifty trainees in the largest class ever trained to be projection technicians. They were the first PT's ever without long and successful records with the company, the first to be hired straight off college campuses.

"OK," Wheeler said. "The system says it's ready for another scan." He swiveled the chair around and saw her. "Hot damn! Look at the little girl with the woman's body." There was speculation in his eye as he looked at Dutch, a hesitation, then he asked, "Think I might sneak a little feel? I hear stories about some of the older guys who consider a passenger like this to be a sort of tax-free bonus, as long as they don't spend too much time at it."

"If you touch her, the only thing you're going to feel is your arm being broken."

"I don't think so. My bones are young and strong. They wouldn't

IN TIMES TO COME

Our August cover story is "The Landed Interests," by Sam Nicholson, another in the "Bard" series. This time Vardos Vayan's intrigues take place aboard a honeycomb starship, a nobel concept in interstellar liners imaginatively represented in cover by John Sanchez.

We'll have two fact articles, paired partly because one is rather short and partly because both deal with aspects of the same vast subject: cosmology. John R. Cramer discusses "Antimatter in the Universe," and Thomas A. Easton asks, "Is the Universe a Yo-yo?"

The August issue will also feature the conclusion of William E. Cochrane's Class Six Climb, several short stories, the usual departments, and one unusual: the annual Analytical Laboratory, wherein we report your evaluation of the stories and articles of 1978. This will also include your feedback on whether and how (if at all) the An Lab should be ressurrected as a monthly or otherwise regular feature.

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break so easy." He said it casually, with only a touch of arrogant threat, but it made Dutch painfully aware of the roll of fat that swelled the middle of his jump suit, and it was one more thing to make him feel older.

Wheeler pressed him, on the trail of an exciting secret about the job for which he would soon be qualified. "Come on, Dutch, don't you ever do a little touching now and then? Maybe when there isn't a trainee around to impress?"

There probably wasn't a PT around who hadn't, at one time or another, but Dutch wasn't about to admit it to Wheeler.

"Drop it for now," he said, his voice flat, barely under control. "Just stay out of the way unless you have questions about the job. Technical questions."

Wheeler sat meekly and folded his hands in his lap, clearly not cowed.

Dutch felt the girl's throat for a pulse. The skin was soft and smooth and he lost track twice before he got the count and nodded, satisfied. He checked the flexible side bars that were molded to the contours of the body from head to foot. Along with the elastic cap they contained her in the simplest possible outline so the computer could reduce the path length of the scan to a minimum.

Wheeler stirred behind him. "Hey, Dutch, isn't it about time for me to practice quiescing a passenger?"

"I told you to stay quiet." It was going to be hard enough for Dutch to do this job himself. He wouldn't even think of her making the trip in Wheeler's hands.

"I think it's a good thing for that young lady that I'm here to chaperone you two."

They'd wasted too much time already. Dutch tried to ignore Wheeler's comments and not rise to the bait. He reached under the table and slid the q-hoop up and over the girl's chest. The arch formed the top half of a circle centered approximately on her heart. He pulled down three stethoscope mikes attached to thin rods, placing one in the center of her chest and one on each side between arm and rib cage. His hands were clumsy and sweaty as they brushed past the girl's breasts to position the mikes. Wheeler's silence was small comfort.

He held a button depressed on the control panel until the light beside it glowed. The hoop had listened to the beat of the girl's heart and now knew exactly where it was. Phasing within the hoop would tune the forcus precisely on target.

When he retrieved the mikes he lifted them by the rods, avoiding any contact, not wanting to feel the warmth of her body. Trying not to look at her face, he flipped a thin scale over the top of the table and brought it down to touch the top of her head. He noticed his hand was trembling as he flipped the mike switch on the wall and said, "How about it, Tokyo?"

"We're ready to receive. What took you so long?"

"Doing a little on-the-job training

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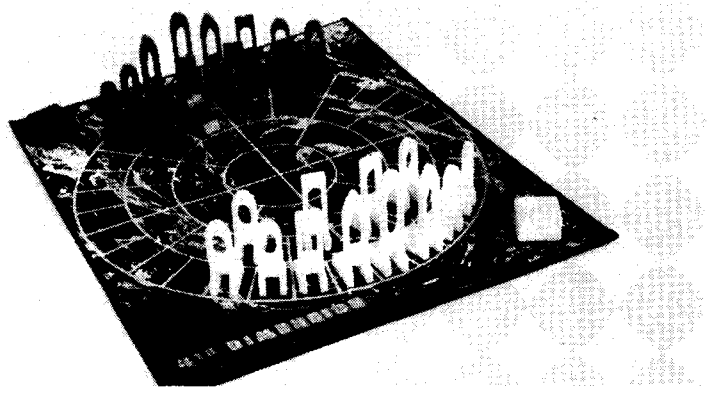

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here."

Wheeler grunted but Dutch pretended not to hear.

"Good. You need it."

"Bull. Starting the lead scan." The tiny pinpoint light from the scanning head began to flick back and forth across the scale, creeping closer to the girl's head. After a few seconds he heard, "Good scan, good reception."

"Right. Take special care with this one, will you?"

"Like always, but we hear stories about you guys on the source end."

Behind Dutch Wheeler coughed and cleared his throat—not a sound you could really jump a guy for.

Dutch found the pulse in her throat with one hand. Time was short. He forced his concentration on the soft throbbing of the artery rather than the life it supported. The other hand was poised over a button on the table control panel. As the scanner light touched a mark one centimeter above her head, he pressed the switch. The hoop hummed and Dutch felt the familiar tingle along the back of his arm. Just before the light touched the white cap, the pulse stopped.

Dutch released the button, turning off the hoop, starting the sweep hand of the timer on the wall, and boosting the head out of the slow speed scan used for set-up. He slid the hoop back under the table, out of the way of the head as it moved over the girl's body toward her feet.

There was no movement in her now. Even blood cells were still as, beneath the moving point of light, the intersection of two beams searched through her body. Above her, in the scanning head, a sensor detected the radiation that resulted from the interaction of the beams with her tissues. Collecting that flood of information and storing it in the computer was like drinking from a fire hose.

During handle-on training in the class that Wheeler had recently completed the instructors had trainees project a ticking clock into the next room, then open it. The sight of those misshapen gears and bits of balance wheel prevented any questions about the need for quiescing a live passenger.

As the scanner moved past the girl's waist a bell chimed and Dutch replaced the hoop over her chest.

The light beam moved quickly over thin sections, such as her arms, but slowed where the thickness increased. Frequently it would pause momentarily, having filled all the available buffers in the computer memory, then resume its motion after enough data had been transmitted to the destination system. It was like a bucket brigade where each man held onto his own bucket and had to wait for the bucket ahead of him to be emptied before he could pour his water into it and reach back for more.

The slowest person in the brigade was at the end of the line. On a table in Tokyo, tended by two technicians in white, lay a device looking like a metal turtle ensnared by a tangle of wires and tubes. As it crept slowly down the table, the girl's head grew from it's

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blunt posterior.

Up to this point in the process she had been handled as information—data to be stored, transmitted, and stored again—and had been moved about at electronic speeds. On the table in Tokyo she was being reconstructed of matter having mass and, sometimes, a reluctance to be assembled into a human being.

Within three minutes from the time her heart stopped in New York it had to be restarted in Tokyo. Four minutes may have been safe, but three had been set as the limit beyond which the company would not risk a law suit. Either the limit was safe or brain damage wasn't that easy to detect in the passengers they'd shipped.

"What's it like, Dutch, the first time you quiesce a passenger and feel the heart stop?" It was simple curiosity this time, with no apparent threat.

"You try to remember the times you've seen someone else do it, and that the passenger always made it. But mostly you're afraid you've just killed someone."

The girl was small and made the trip in a little under two minutes. No sweat. As the scanner hit the foot stop the bell chimed again and Dutch heard the hoop hum. He quickly felt for the pulse and found it. Good. Sometimes he had to retrigger the hoop manually. He pulled down a length of plastic hose, fitted the mask at its end closely over her nose and mouth and got her breathing going with no trouble.

The restart procedure at the source end was a safety precaution. On rare occasions a second transmission was required. It was a prudent bit of insurance, and the cause of the case of nerves Dutch was building.

There was nothing to do then but stand and watch the calm, beautiful face until the technician in Tokyo said, "We've got her, and I see why you asked for extra care. She's passed the mental and coordination tests and is on her way to see her very loving and very rich father."

"Right." He switched off the mike. "All right, Wheeler, run that reset cycle again." He ran the side bars back and opened the chute door. He took a deep breath, tipped the table, and dropped the girl into the hole.

She stopped, crumpled against the lower door—the heavy, insulated lower door—and lay there longer than was good for efficiency, or for Dutch's sleep that night.

And what does it feel like the first time you tumble a person into the chute and hit the button that opens that lower door? You try to think about the live target, the passenger walking around in Tokyo, or London, or Buenos Aires. You try to think of the thing in the chute as the source, just data that's no longer needed. But you know damned well, and for the rest of your life, that you've just killed a living human being.

"They told us in class you shouldn't hesitate," Wheeler said.

Dutch reached back without looking at the control panel and pressed the button that closed the hatch cover. He had safely projected a passenger

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from New York to Tokyo and had to get ready to send another. But he would not ever again be as ready as he had been before he watched the hatch cover close over the girl, huddled in a little white heap.

He turned to see Wheeler, one arm draped over the back of the chair, watching him speculatively. Wheeler grinned and said, "I think that little bit of stuff really got to you." He swung back to the terminal, his back to Dutch.

"Hey, Dutch, you know what I think?"

"I couldn't care less."

"I think you don't have the stomach for this job. You think those are people you're dropping in the hatch. I bet you'd quit if it weren't for the super pay check and the dream of a luxurious early retirement."

Dutch didn't answer.

"Now me, I don't care about elegant technical challenges. I want the money, pure and simple. It wouldn't bother me to drop my mother off that table because I'd know she'd be walking around somewhere ready to give me hell for not writing often enough to suit her."

That was the thing between them. Dutch had seen the system grow, had built part of it, and loved it. The problem of disposal of the source passenger had always baffled him. His characterization of the passengers as ruthless was a crutch, and was cracking as he leaned more heavily on it all the time.

Wheeler saw only the money. He was made for the job because he could dump anyone through the hatch and go home to a good dinner and a full night's sleep.

Wheeler chuckled. "I wonder what it would be like to wake that little girl up at this end. Little bit of source data never hurt anybody, and after that, down the chute. No one would ever know."

Dutch stood frozen, unable to vent the anger he felt rising in his chest. He knew Wheeler was deliberately provoking him and he couldn't control his reaction. But before he could move, the door burst open and Ann Compton, the terminal manager, came in almost at a run. For once she seemed relieved to find the equipment idle.

"Dutch, we need you in unit two, quick! There's bad trouble, and we've got a U.S. senator on the table."

He glanced around the room to make sure he wasn't leaving something that could become a problem.

"Damn it, Dutch, this place can wait! Come *on*!"

He stopped halfway through the door into unit two. It looked exactly like the room he'd just left except that the scan table held the fattest passenger he'd ever seen. Over the senator's gut he could see Dwight, looking pathetic.

"How much does he weigh, Dwight?"

"One forty-three point eight, after we took his shoes off. That was a waste of time."

"How far did you get?"

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Dwight started to relax as Dutch took charge. "I quiesced him and we started the scan. At three minutes five we were just past the hips and I aborted and restarted his heart. The Paris technicians had a few choice comments about the mess I made on their table."

"That's their problem. You made a good decision." The look on Dwight's face told Dutch he'd made a friend for life.

"Do you need anything?" Compton had slipped quietly into the room. She was a gamesman, an aggressive corporate climber, and she had sense enough to stay out of the solution of technical problems except to clear obstacles for the workers.

"Don't leave," Dutch said. "I may need for you to use some of that managerial authority to bend a few rules. Are you sure we can't just refuse to ship this slob until he loses about forty kilos?"

"That slob, as you call him, is our best friend in Washington."

"Yeah, I know who he is—Berg of Wisconsin. He's the champion of projection and leads all the fights to protect our little business from the powerful airlines. But from what I read in Jack Anderson's column he's practically on the company payroll."

The comments didn't bother her. She'd heard them all before and they were extraneous to the problem at hand. "Can you get him to Paris, Dutch? There's a press conference waiting for him and he's made a big thing of his first projection. If we fail we're going to have egg on our faces."

Maybe he should let them all fail. He could say the time was too short, that there was no notice, that they hadn't given him enough warning for a problem of this size—no pun intended. The senator may be embarrassed away from his support of projection. The expansion, without government assistance and protection, probably wouldn't be successful. It was known to be a large financial gamble at best. Then Dutch could go back to shipping the predators of the world and quit worrying about having to tumble beautiful young innocents into the chute.

But it was one interesting technical problem, and he'd even been speculating on a possible solution for some time. It might work, and it would be a shame not to test it. Hell, why not?

"I think we might be able to get the senator to Paris. There's something I'd like to try, but we'll have to dedicate the whole computer to this unit."

"Shut down the other nine units? Do you know how much that would cost?"

Dutch leaned back against the table and watched her squirm. A decision like this could be hazardous to a fast-rising young manager's career. "The company likes bold, dynamic action in crisis, and you could look like a hero for a few bucks." He waited while she weighed alternatives.

"Are you willing to bet your job it'll work?"

"Hell, no. I don't play that game.

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I'm just a technician. But I'm pretty sure it'll work. We won't lose the senator at any rate. All you risk is a problem with the passengers who have to wait a few minutes, and a slight loss in production."

"Slight!" She took five more seconds, then said, "You've got what you need, but it'll take a few minutes to finish any projections that have been started." She lifted the wall phone and dialed two digits. In unit two they could then hear her voice through the speaker as well as across the room. "This is Ann Compton. Sign off the system as soon as you can complete any projections in progress." She covered the mouthpiece. "Anything else?"

"Tell Gambill to switch his master console to this terminal and to get in here."

She disconnected, redialed, and passed on the message. There was no argument—Gambill smelled an interesting problem right through the wires. By the time three units had cleared off the system Dutch and Gambill were huddled at the console nodding, finishing each other's sentences. Dutch could feel that tingle up his spine and the strange high detachment that came with being seized by a problem, and the pleasure he got from working with Gambill. They had worked together for over a year on the original software for the project.

"I like it," Gambill said, reaching in his jacket pocket for his pipe, then remembering that there was no smoking in the projection room. "It's simple and elegant. You haven't forgotten much that I taught you, kid." He leaned back and nodded, looking at nothing in particular while the images of the solution flicked across his internal field of vision. He was heavy and soft, his body having been neglected except for the minimum needed to keep it going while he lived his real life solving programming problems in his mind.

"I can do what you want with the computer easy enough. I'll give this unit the whole buffer area—ten times what any unit normally gets. You know, though, that you still can't store the whole body." He caught himself reaching for the pipe again.

Dutch shrugged. "If we can get a third of it we should finish the scan within three minutes and get him restarted in time. Then the reconstruction unit in Paris can finish up. something over five minutes total."

"*Five minutes*?" Compton hadn't been following the conversation closely, but that got her attention. "What the hell good does it do to finish the scan fast and get the source passenger restarted if the target is suffering brain damage waiting for his feet to come through?"

"I'm going to ship him feet first," Dutch said without looking up. "His brain will stay nice and preserved in the computer until last. The extra time won't hurt his legs."

Compton blinked in surprise. "Why haven't we done it that way before?"

"Because it wasn't necessary." He

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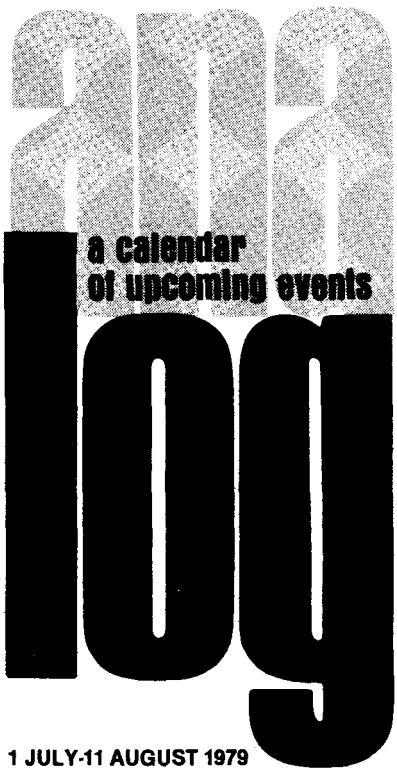

1 JULY-11 AUGUST 1979
CLARION Writers' Workshop at Michigan State University. Writers in residence will be Robin Scott Wilson, Algis Budrys, Carol Emshwiller, Thomas Disch, Damon Knight, and Kate Wilhelm. Info: Dr. James McClintock, Justin Morrill College, Michigan State University, East Lansing MI 48824.

4-8 JULY
WESTERCON 32 (Western Regional SF conference) at Sheraton Palace, San Francisco, Cal. Guest of Honor—Richard Lupoff, Fan Guest of Honor—Bruce Pelz. Special Guest of Honor—Sherry Gottlieb. Toastmistress—Marta Randall. Banquet, art show, hucksters. Info: Westercon 32, 195 Alhambra St, #9, San Francisco, CA 94123.

6-7 JULY
RIVA-CON (Louisville KY area SF and Star Trek conference at Stouffers Inn. Films, masquerade, games. Registration-$6.50 until 1 June, $10 thereafter. Banquet $9.50. Info: Ohio Riva-Con, P.O.Box 832, Jamestown NC 27282.

13-15 JULY
ARCHON III (St. Louis area SF conference) at the Stan Musial and Biggie's Airport Hilton Inn. Guest of Honor—Joe Haldeman, Fan Guests of Honor—Lesleigh and Hank Luttrell. Registration—$5 until 1 July, $8 thereafter. Info: ARCHON, c/o P.O. Box 15852, Overland MO 63114

23-27 AUGUST 1979
SEACON 79 (37th World Science Fiction Convention) at Metropole Hotel, Brighton, U.K. American Guest of Honour—Fritz Leiber, British Guest of Honour—Brian Aldiss, Fan Guest of Honour—Harry Bell, Toastmaster—Bob Shaw. Registration $10.00 (supporting) $20 (attending). Info: Seacon '79, 14 Henrietta St., London WC2E 8QJ, U.K. This is the science fiction world's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, banquet, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer.

ANTHONY LEWIS

Items for the Calendar should be sent to the Editorial Offices, ***four months*** *in advance of the issue in which you want the item to appear.*

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asked Gambill, "How many more units have to clear?"

Gambill flicked three fingers smoothly over the keyboard and checked the screen. "Two, and I'd say they're just about done."

"Good. Ann, you and Dwight give me a hand turning this tub of lard around." Compton struggled with the legs, the easy end compared to the limp neck and flabby shoulders.

Over the speaker there came a voice with a French accent. "New York? Are you taking one of your coffee breaks?"

Dutch switched on the mike. "We're going to make another attempt to set a record, Paris. Brace the legs on your table." He quickly filled them in on what to expect. They weren't enthusiastic about the time required, even after Dutch explained the feet-first idea.

"We have the mess at this end to clean up, you know. It was bad enough with the legs not complete. If you should fail to finish the chest cavity we would have to close this unit for the day."

"Cheer up. If it works I'll send you a case of New York State champagne."

"Perhaps cleaning up wouldn't be so bad, given that alternative."

Gambill called, "All clear, Dutch. The system is yours."

"Paris, are you ready for the lead scan?"

"For many minutes now."

"Here it comes." It felt strange watching the scanner creeping closer to a pair of stockinged feet. The hoop barely cleared Berg's chest, but it worked.

"Look at that *go*," Dwight said half a minute later. "I've never seen it *move* that steady."

"It never has. Hey, Gambill, this thing works better than I expected."

"It's still going to be close."

The four of them watched the race between the scanner and the timer. There were a few white knuckles, but they made it. When Berg was breathing again Dutch said, "Nothing else to do here until Paris confirms the projection."

Compton started for the door. "I'm bound to have some ruffled feathers that need smoothing in the waiting room. Can the other units come back on line?"

Gambill said, "Tell them to sign back on. They'll be active as soon as I've undone by handiwork."

"Right." She turned to Dutch. "Thanks. I'll get a letter in your record about this."

"Don't thank me yet. It isn't over."

"You're just trying to cheer me up." She closed the door after her.

Dutch and Gambill stood grinning at each other. It felt like the old days when they would finish a third-shift test session as the sun was coming up, then wind down over a breakfast of steak and eggs, standing up all the dead bugs and shooting them again.

"Can you move back to the systems programming area?" Dutch asked. "We've got to get back to normal

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around here."

"Sure. I need a quiet place too." From long habit he hunched over the keyboard, hiding it as he entered the codes and passwords that switched the master console back to his desk. As he left he saluted Dutch with his beat-up old pipe and started packing it before he was out the door.

Except for a sigh from Dwight, it was quiet in the room for some time. Then Dwight said, "It's over."

"Not quite."

"New York," the French voice said. "We have him. How can anyone stand to eat enough American food to get that fat? But he is here now, and with the press."

"Have the reporters seen him?"

"Yes. Is anything wrong?" There was a note of concern. It was too late now to dispose of a mistake and start over.

"No, everything's fine—at both ends."

"Good. We're ready for the next passenger who wants to visit our beautiful city."

"Now that may take a while." He turned off the mike and opened a small cabinet. He removed a syringe, pushed back the senator's sleeve, and slipped the needle into his arm.

"Dutch! What are you doing? You heard them say he's walking around at the other end."

"Don't worry, Dwight. It's going to be all right. Help me get him up." By this time Berg was blinking his eyes. He was coming around well by the time they had him sitting upright. He wiped his forehead, then felt his head.

"What's this strange cap? And where are my *shoes*?"

"Oh, yeah. Get them for him, will you, Dwight?" Dutch took the cap and helped with the shoe laces. "Dwight, stay here, quietly, for about ten minutes, will you?"

"But—"

"Do it." Dutch led the senator past the closed doors of the other projection units, down a hallway, and into the waiting lounge.

"Not very fancy," Berg said, starting to feel better and act officious. "Expected better in— This isn't Paris! I'm still in New York!"

"Partly." Dutch used both hands on Berg's arm and led him toward the street. An elderly woman in young clothes was slouched in a chair, glumly watching the news on TV. As they passed, the reporter said, "And now, from Paris, we have live coverage of the arrival there of Senator Berg of Wisconsin. This is the volatile senator's first use of the transportation medium he's been sponsoring so strongly in the nation's capital."

Berg stopped, fascinated, as the scene shifted to show him smiling, nodding, and answering questions for reporters, describing the marvels of projection, ridiculing any suggestion that he would profit from its growth.

"How are they doing that?"

Dutch shrugged. "You're there. We projected you."

"Impossible. I can't be in two places at once." He shook his chins

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slowly as Dutch steered him out the door and onto the sidewalk. No one tried to stop them. Too bad. It would have been interesting to see what they would do with a source passenger who was walking around in public, particularly one who was their best friend in Congress.

The cab drive Dutch hailed acted as if he saw people in jump suits and men who weighed a hundred and forty kilos every day. New York cabbies aren't surprisable.

"This is ridiculous," Berg said, refusing to get in. "I have to get to Paris immediately for a press conference."

"You're there, Senator. You saw that on the TV."

"But I'm here!"

Dutch sighed and waved the impatient cabby on. The swearing was starting to interfere with the conversation. Berg started for the door of the terminal but Dutch managed to get him stopped.

"Look, Senator, you're not very smart for someone who's supposed to be running the country. Of *course* you're in two places at the same time. *Everyone* who projects is in two places for a short while. You're just the first person who ever woke up at both ends of the trip. I know—it was my job to get rid of the passenger at the origin." The past-tense reference to the job came out without thought, and he realized with relief that it was true.

"My God!" The senator's Wisconsin pallor paled even more.

Dutch laughed. "If you go back in there you just might cease to exist in New York." Berg had energy for only the slightest nod. "Tell me something. How do you feel about projection now? Will you still support it?"

He took a step toward the street, waving wildly at a cruising cab, "Don't be ridiculous!" He was wedging himself into the door almost before the cab stopped.

"Hey, Senator, you've never seen a floor fight like there's going to be when you get back from Paris, still advocating projection."

"I'm not *going* to Paris!"

"You don't have to go. You're already there."

Dutch was still laughing at the retreating cab when Compton grabbed him by the shoulder and spun him around.

"What have you *done*?"

"Nothing. I just neglected to kill a U.S. Senator. That hardly seems a crime."

"You've screwed yourself out of one high-paying job, that's what you've done, and you've finished projection completely."

"I don't think the truth will make much difference in the traffic. The publicity may even create a fad. People who have projected are going to be objects of curiosity for a while—centers of attention. As to the job, keep that safe for me in a warm place."

"But what will happen to me?"

He laughed again and said, "Frankly, Scarlet, I don't give a damn," and turned and walked away. ■

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THE REFERENCE LIBRARY

by Thomas A. Easton

A few years ago, I published a short article on something I called "The Science Fiction Nonstory." In it, I identified one essential feature of science fiction as "projection of the possible or plausible, not necessarily the probable," rather than story *per se*. I went on to say that a science fiction nonstory "must resemble a popular science article more than anything else. Like a science fiction story, it must start with known and true science of some kind and then hare off into the blue. Only thus can it be called fiction. It should, however, look like fact. You have succeeded completely only when someone takes you seriously."

I was talking about short pieces at the time, the sort of thing I sometimes do myself. But there was nothing about my definition that precluded book-length nonstories. If I thought anything at all about such things then, I must have supposed they would be hard to sustain. The pure lie, without a story wrapped around it, seems to work best when short. This certainly is what I think now, after reading what may be the most ambitious nonstory of all time, but it will not stop me from recommending the book to anyone who will listen to me.

Handbook for Space Pioneers: A Manual of the Galactic Association (Earth Branch), "prepared by" L. Stephen Wolfe and Roy L. Wysack and available as a $7.95, large-format, 198 page paperback from Grosset & Dunlap (1978), is the book I mean. Its basic premise is that the present is the 24th century, when Earth holds 15 billion people and humanity is in contact with four alien species, when economical faster than light space travel is a reality and eight worlds are open for colonization. The Galactic Association of Intelligent Life (GAIL) is a multispecies organization that promotes the exploration of space and the exchange of information between civilizations. GAIL's Earth Branch explores for new worlds, transports and equips colonists, and exchanges information. It also screens potential colonists, a process which begins when the *Handbook* falls into someone's hands.

The *Handbook* presents the background of the colonization effort, the role of GAIL, and the criteria for colonists. But this material is only a small part of the book. Most of the rest is a catalog of planets open to colonists: **Wyzdom, first settled; Poseidous,** world of islands and cultural choice; Brobdingnag, land of dinosaurs; Genesis, where all land life must come with the colonists; Mammon, metal-rich birthplace of fortunes; Yom, home to its own borderline intelligence; Romulus, twin world whose partner houses a young civilization; and Athena, newest, most paradisiacal, and site of a single

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enigmatic artifact. For each world, the *Handbook* provides maps, describes the physical environment, climate, and life forms, gives a brief history, offers a "how it is" account by a resident, and lists "opportunities for immigrants." The book ends with a long appendix on the details of space transportation, including the plans of a very sensible starship which can detach pieces of its structure to serve as highrise housing for new colonists. There is even a questionnaire which the reader can fill out and send, with three bucks, to GAIL's San Diego address to be evaluated as a potential colonist.

You spot the book immediately as a propaganda piece, designed to pull the suckers in. You doubt the eight worlds are nearly as good as GAIL claims. But you are drawn to make your choice—Athena for me—fill out the questionnaire, and get ready to embark. Unfortunately, the illusion of truth or even propaganda stretches thin after awhile. The book goes on so long that the conflicts with present reality eventually win out and bring you back to Earth. Nonetheless, the book is well worth reading. Something very like it will surely exist someday, perhaps well before the 24th century, and while it *is* fiction, it is realistic enough to give you a sense of future such as few stories can manage. The astronomy, physics, and biology it presents are all reasonable enough, rarely extrapolating too far beyond present knowledge, and the authors make few outright mistakes: the few anomalies include such things as a "neuron drive" for probes, the notion that insulation reduces thermal gradients (actually, it increases them by retarding heat movement), and the conceit that an Earthly population of 15 billion can be comfortable, albeit highly regulated (maybe so, but I strongly doubt it.)

How to sum up the *Handbook for Space Pioneers?* It is a nonstory, a good one, and it can be read with a cool, intellectual excitement. If only it were true! But truth is a rare commodity in science fiction, never rarer than when you find that other kind of excitement—the snickering, wheezing, belly-slapping, howling kind—called Papa Schimmelhorn. Finally, after far too long a wait to suit this reader, Reginald Bretnor has collected his tales of Papa's remarkable life into a book, ***The Schimmelhorn File:*** *Memoirs of a Dirty Old Genius* (Ace, 1979, $1.95, 280 pp.). That dirty old *chenius* is here, from his first recorded appearance, with his *gnurrpfeife* that brings the *gnurrs* from the *voodvork* out, through his first encounter with his nephew Lidtle Anton, who can see around corners and through ladies' underwear, and on to the ladies from Beetlegoose Nine, the time-pony, the antigravity dragon search, and the SODOM serum. Only the last is unfamiliar; it seems to have been written especially for this volume, but I will say no more than that the ending seems completely unfair. Dirty old *cheniuses,* full of vinegar from spending more than eighty years chasing ***der lidtle*** pussycats, should never be cowed. Especially not when they acquired their ***chenius*** by janitoring in Geneva's Institute of Higher Physics and packing reams of overheard theory into their subconscience.

Still another kind of excitement is the kind that emerges in the reader's

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mind as he or she begins to recognize an old idea that is being handled extraordinarily well. This happened to me with George Turner's *Beloved Son* (London: Farber and Farber, 1978, £4.95, 375 pp., hardbound). The Pocket Book will be forthcoming. Turner is an Australian novelist and science fiction critic. This is his first science fiction novel. On the surface, the story is an old chestnut, the tale of the sublight starship that returns after many years to find the world its crew left changed into something unrecognizably alien. Here, the old order was brought down by deliberately created and released plagues—genetic engineering with a doomsday vengeance. The new order is peopled by the young and guided by a few survivors of the old. There are few people beyond their thirties, since most older folks have been removed as obstacles to what the young saw as necessary change. The young have now achieved a near utopia, they think, but there are viciousness and plots enough. The world, for all its change, is still human.

The story hinges on the biological sciences, on cloning, genetic engineering, personality transfer from old bodies into young clones, and mind-enslaving hypnotic drugs that are absorbed through the skin and act instantly. There is a secret lab, hidden under a mountain ever since the bad old days, and here is the center of a plot to take over the world and remake humanity in a new "rational" image. It's all unlikely, and some of it is probably impossible, but it works in the story. Turner does not get so specific that he runs the risk of egregious error, which is how many writers manage to spoil their fiction. Errors tend to shatter the withholding of disbelief that is so necessary to science fiction.

The viciousness and the plots emerge when the starship's crew members arrive. They are catalysts, and soon most are gone, destroyed by what has become of their homelands, a hyper-religious Russia and an American Soviet, for two. The survivors are the Australian Captain and the now-homeless English psychiatrist. The Captain is the center of the story's major plot, for the hidden lab contains his clone-brothers, and they are tools of the would-be conquerors.

Beloved Son is the story of how the Captain and the psychiatrist defeat the plot and turn it to other ends. But this is hardly the old idea I first mentioned. It *is* handled well, even though Turner sometimes takes a didactic tone, but handled even better is the underlying theme, and that is what one begins to recognize about two-thirds of the way through the book. *Beloved Son* actually seems to parallel a more classic story, that of *Revelations.* It does not retell *Revelations,* for the parallelisms are all implicit, not explicit, and the clues are few, but the story is the same, even to the Anti-Christ. It stops short of Judgment Day, but that may be to leave room for a sequel.

A less exciting and quieter pleasure is Peter Costello's biography, *Jules Verne* (Scribners, 1978, $10.95, 239 pp.). Verne is still well loved seventy-four years after his death, but it is worth asking whether he deserves all the attention he receives. He began his career as a would-be playwright, latched onto a good thing with *Five Weeks in a Balloon* at the age of

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thirty-four, and kept it up through more than sixty of his "voyages extraordinaires." In the process he developed a form of fiction that later earned him the title of "father of science fiction," though Costello prefers to call him "the inventor of science fiction." Either title might suit H.G. Wells better, but Verne did take one essential step toward what we now know as science fiction: he was the first to use fiction as a vehicle for popularizing the latest scientific discoveries and inventions.

This is where Costello's book has its strength. Costello has delved into the newspapers and magazines that Verne might have read to trace the effect of contemporary science on Verne's stories. He has shown this effect by pointing out the similarities between, for instance, La Landelle's helicopter design and the flying machine used by Robur in *Robur the Conqueror.* The tracing of parallels goes further, to events in Verne's life that appear, transmuted, in his novels, to the spoor of politics, to the traces of the daily news. In the process, we learn how many of Verne's famed prophecies really belonged to others. Verne in fact invented very little, if anything, for his stories, and this is where he loses his claim to being the true father of science fiction. As we know it, science fiction requires the invention of new ideas and devices, based on no more than a germ, a hint in the theory, even a fancy. (If Verne had really written science fiction, he would have responded to the discovery of Maxwell's equations with a novel that predicted radio, TV, and radar.) This is what Wells brought to the field, and this may be why science fiction was so scorned until recently, where Verne's books were so popular. Verne, for all the supposed wildness of his ideas, was closely and recognizably linked to his present. Only recently has the present become so wild, so quickly and wonderfully changing, that true science fiction seems acceptably realistic or plausible. (This is not, of course, to say that Vernian fiction is no longer written; much of what we call science fiction actually relies on existing science.)

Is *Jules Verne* worth reading? That depends on how much you like biographies. As such things go, it's not a bad job at all, for it does succeed in giving a sense of the man, his thoughts, and his times. But like so many other biographies, it is a dry thing, full of names, dates, places, and events, with all the juice left in the grave. How much is lost with the flesh!

If we want the flesh, we should pay more attention to a person's writings. That is where he leaves it, after all, a paring at a time. That is why we treasure our best writers, for the flesh they give us is tasty with courage and wit and sauce. My metaphor may be a little strained, since it relies on the dubious notion that there is a bit of cannibal in each of us, but I invite you to test it with Joe Haldeman's collection of stories, *Infinite Dreams* (St. Martin's, 1978, $8.95, 278 pp.). From what I have seen and read of this man, he is a friendly, beer-swilling, cynical son-of-a-gun, and this book does nothing to change my mind. The stories are each preceded by a few conversational words on how they came to be, and there is an afterword on the practice of writing. Of the stories

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themselves, they are a varied lot, about half of them first appeared in the pages of this magazine, and I have no real favorites among them (though they include no real dogs either). They're all tasty, from "Counterpoint" to "All the world in a Mason jar" to "Tricentennial," and the taste is often bitter. Read them all, and pray that Haldeman lives for a long, long time. If he improves as much as Heinlein did, we have wonders to look forward to.

Fred Saberhagen is finally beginning to give us glimpses of the wonders there are in him. He now seems to be breaking loose from his "Berserker saga"—good enough space opera, but not much more—to give us delicious tidbits like *The Holmes-Dracula File* (Ace, 1978, $1.95, 249 pp.), in which the vampire and the master detective prove to have ties of blood, and *The Mask of the Sun* (Ace, 1979, $1.95, 309 pp.). *Mask's* premise is time travel, alternate worlds, and a war to change history in a parallel Earth. A Florida snorkeler spots a flash of gold in the sand and retrieves a mask that reveals the wearer's optimum course into the future. It is a "coincidence machine," and it leads the finder's brother into the war, wherein he fights to let the Incas defeat the Spanish so that a far-future civilization derived from the Incas will not be destroyed by their Aztec opponents. The story has it all, love, action, and local color, in a best-of-both-worlds blend of historical and science fiction. Read it, and enjoy.

I've saved the reissues for last partly because there always seems to be more to say about new work and partly because if I run out of room I can drop them without feeling too bad about it. There are two for this column. One is Poul Anderson's *Ensign Flandry* (Ace, 1979, $1.95, 277 pp.). This 1966 novel is the one that introduced Dominick Flandry and the Merseians to the world, and its handling of the theme of the novice spy who pulls off coup after coup in the faces of despicable enemy and bumbling superiors is fully up to Anderson's reputation. I need say no more unless you just haven't read anything of Anderson's before, in which case I urge you to grab the first book you see with his name on the cover. I won't guarantee that you will feel totally satisfied after finishing it—he's a potato chip and beer writer—but I will guarantee you a good read.

The other reissue is Theodore Sturgeon's 1950 novel, *The Dreaming Jewels* (Dell, 1978, $1.75, 188 pp.). Sturgeon is another man who needs no recommendations, and this book is one of the reasons why. It concerns the crystalline life forms that share this world with us, never competing, never being noticed in their guise of more ordinary organisms. A carny freak-master is on to them and tortures them into dreaming freaks for his show. A dreamed boy has a doll whose eyes are two of the crystals. When the boy runs away from home and joins the carny, the eventual conflict between the two becomes inevitable. The resolution of the conflict seems less inevitable, even contrived, for it depends on the boy's suddenly emerging powers. It is almost *deus ex machina,* but for all that it fails to spoil the wonder and delight Sturgeon creates with such a sure hand. Another recommended read. ■

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BRASS TACKS

Dear Mr. Schmidt:

Shame on Analog for allowing a glaring error in "Songs of a Sentient Flute" in the Feb., 1979, issue. Tamarack Kapule's color change from dark hair, eyes, and skin to white hair, blue eyes, and pale skin as a result of living on the planet Medea was referred to as a "local mutation." A mutation? A change in the chromosomes? No way!

Try rereading Lambe's guest editorial "Biological Ignorance" in the August, 1978, Analog. It discusses this very point.

Mostly, though, Analog is a terrific magazine. I await it eagerly every month.

Joanne Mitchell, Ph.D.
169 Black Walnut Dr.
Rochester, NY 14615

Dear Mr. Schmidt:

This letter contains two comments, one compliment, one congratulation, and a complaint. Since complaints are generally the nastiest of creatures let's dispose of it first.

What? *Omni* is the first magazine to combine science fiction with science fact. Well, that's what their ad in Analog said at least. Gee, and I had always thought I was reading science fact in Analog. You wouldn't promote false information for filthy luker would you? Surely not!

As for your appointment as editor, Mr. Schmidt, I offer you sincere congratulations and best wishes. Mr. Bova's stewardship marked no decline in Analog's quality and if you follow the guidelines you put forth in your opening editorial yours won't either. By the way that covers both comments and the congratuation.

The compliment goes to Scott Orson Card for his explosion of marvelous stories. Mr. Card seemed to burst on the scene from nowhere with one of the best stories I've read in years, "Ender's Game." Since then I can hardly pick up an Analog without seeing a new Card story. Fantasticly enough they seem to keep getting better. "Breaking the Game" simply broke me up.

James Eris Reddoch
121 Pine Lane
Milton, FL

Well...we know better. Advertisers have poetic license, you know, and sometimes they get carried away.

Thanks for your kind words. I certainly hope *to keep the quality up.*

And I think it's reasonable to expect that you'll be seeing more from Card.

Dear Stan:

This is in response to the article in the December, 1978, issue by John Gribbin, entitled "Science is too Gloomy." It makes a number of points that are unsound, and since these points have often been made by others, it is appropriate to explain why they are unsound.

Technological progress comes with

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the realization of certain limited opportunities or potentials in natural principles or in the situation. Each such potential can usually be characterized by some performance value. For example, the Industrial Revolution resulted from realizing the potentials for improving the efficiency of conversion of energy from one form into another. Over a century, most efficiencies were improved by about two decimal orders of magnitude, from less than one percent to more than fifty percent, which is near the theoretical limits for most kinds of conversion. Only minor improvements in this direction remain possible, although some may have significant impacts. The form of such improvements in performance values is usually that of an "S" curve, which rises exponentially at first, then slows as the limits are approached.

Economic or ecological growth results from realizing limited potentials in the situation made possible by technological progress. It may take the form of an "S" curve. On the other hand, it may also take the form of an overshoot and collapse before some sort of stability or "steady state" is achieved. Generally, when overshoot and collapse occur, the eventual steady state level is lower than it would have been if growth could have been slowed as it approached the steady state level attainable before overshoot occurs.

Some technological optimists, including many science fiction writers, like to believe that there is no limit to the potential for technological progress, and some economic optimists like to believe that there is also no limit to the resources and situation needed to support economic or demographic growth. Such limits exists, however, although it may not always be easy to estimate what they are likely to be.

The sound approach to predicting how much progress or growth remains to be made is to analyze each technological performance value and each factor needed for growth separately and in combination, and to develop models for the ways these things might interact with one another. One should not attempt such a thing with any preconceived notions based on wishful thinking or ideological bias.

The Club of Rome "Limits to Growth" study was a crude but useful attempt to model the interactions among economic, demographic, and ecological growth factors for the earth considered as a closed system. The model exhibited overshoot and collapse for most growth factors in the near-term future for most of the plausible assumptions concerning the state of the world system in the present and past. This study and its implications for policy have received a great deal of well-deserved attention, and resulted in a great deal of controversy. A number of attempts to criticize or refute the study have been made, and many of them have been adopted by many people as more acceptable than the "Limits to Growth" study, which has been denounced as gloomy or pessimistic.

Unfortunately, a more thoroughgoing modeling effort, which takes into account the points in this controversy that have any merit, still yields a rather gloomy outlook, although it also affords a few rays of hope. We need to sort out the alter-

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natives as realistically as we can.

First, economic demographic, and ecological collapse, if they occur, and it seems that they will, do not necessarily mean the doom of humanity or civilization or the end of all possibility for recovery, although they will undoubtedly be a great setback and an enormous human tragedy. It is possible for the collapse to be managed in a way that reduces the trauma and accelerates eventual recovery provided that we plan for it properly and understand what is feasible and important. Humanity has suffered disasters before, and with some preparation, we can do a great deal to cut the losses and build a better future. We need to think of it as an approaching natural disaster, like a hurricane or flood, although on a larger scale.

Let us lay to rest, however, the hope that the "demographic transition" will occur worldwide in time to prevent a world population dieback. No way. That economic prosperity tends to bring a reduction in preferred family size is likely to be true, given sufficient time, but preferred family size, like so many other of the factors relevant to a solution, is as much cultural or traditional as economic. Those who imagine that family size will drop immediately after prosperity is achieved have a very ethnocentric perspective that fails to appreciate the role of the family in traditional societies. Neither is it likely, for cultural reasons, that the kind of social revolution that has occurred in China, resulting in control of family size, will occur in other regions of the world. There is also no realistic possibility that such economic growth, even if it would work, could be achieved, no matter what anyone did or how economic product might be distributed. Economic growth depends on a balance between capital formation and consumption. If economic product were to be distributed more equally than market processes do, the result would be reduced capital formation and eventual economic collapse if it is carried too far. The principal need in the next few years will not be for more equal distribution of increased consumption, but for increased investment and capital formation in new patterns made necessary by the changing situation. This will result in reduced consumption, but it has to be done.

There is also no realistic possibility of arresting ecological collapse. The processes of deforestation and desertification and erosion are proceeding too rapidly and have already gone too far to make it likely than we can save more than a few samples or enclaves of natural habitats, and then only in a few of the "rich" countries.

Some economists have argued that increasing prices for depleted natural resources will result in substitution of other resources. That argument fails to offer much hope, however, if one gets down to the specifics of which resources might be substituted for which others. It is not a price model but a real cost model that is appropriate for considerations of resources and economic growth. As it turns out, the real costs for the substitutes for most critical resources are increasing just as fast, if not faster, than the real cost of the primary resource is. The principal resource is energy. Cheap energy can make possi-

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ble the reclamation of resources that would otherwise be unrecoverable, but there are practical limits to material processing no matter how cheap or abundant energy might become.

The impact of rising real costs should not be neglected., A small increase can have enormous impact, and byond a critical point, can make the difference between economic growth or collapse. Much of the current increase in prices that is sometimes misnamed "inflation" is not the result of an increase in the money supply with respect to goods and services not the result of increased wage demands from organized labor, but the result of increased real costs that everyone is trying to redistribute off onto his neighbor. In the face of rising real costs, monetary, fiscal, or wage policy can do very little. Only technological progress or the discovery of new cheap resources can alleviate the problem.

There are two bright rays of hope in the otherwise gloomy picture, however. The first is the development of space resources, which would mean the settlement and industrialization of space, and the second is progress in information processing technology, which has brought us the microcomputer and may provide the means to more effectively manage the world economy and human society. Neither of these things offers the possibility of entirely avoiding global eco-disaster. There just isn't time for that. However, they can make a great deal of difference to a great many people, and to the kind of civilization that ultimately emerges from the coming chaos.

For a variety of reasons, the promise of neither of these alternatives may be realized. The first will require an enormous investment by the government of one country, the United States, at a time when there will be increasing demands for public funds by conflicting interests, most of them responding to declines in real living standards which are the result of increases in real costs of critical resources. The second will face strong resistance from people who are not prepared to use this new technology or who feel threatened by it.

The cost of developing space has, however, probably been overestimated by its proponents, contrary to what many opponents might think. The expected rates of return for space development, given only current technology, is likely to make it self-financing in short order. It is absurd to plan on fabricating photovoltaic cells on earth and transporting them up to solar power satellites except for a prototype station. Space provides the ideal environment for the fabrication of things like solar cells, large mirrors, or integrated circuits., It is not difficult to show how a single large photocell many kilometers across could be fabricated in space in a few hours at a marginal cost of several orders of magnitude less than the cost of fabrication on earth, with little cost for transport.

The trouble with the space program up to now has been that most of the returns have been external, diffused through society in ways that make accounting difficult and don't yield dollar returns directly back to the space program. In fact, the rate of return on the space program to society as a whole has probably been greater than almost any other investment of

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public funds we have made or might have made, except for a few projects that wouldn't require as much money taken together, mostly in the areas of research and development. The problem is people and politicians that don't understand that.

In the final analysis, the principal threat to the survival of most of the things we value is human ignorance and pigheadedness. The situation we have gotten ourselves into requires more knowledge, foresight, imagination, and teamwork than we have needed before. What humanity needs now is a rebirth of maturity, and the abandonment of outdated, simplistic, and contentious ways of thinking. It has become somewhat unfashionable to call others' behavior "immature," but one of the most important things that we need to do in the world today is to make everyone on earth aware of that concept and what it means to the behavior of individuals and groups: things like voluntary public service, personal integrity, political compromise, conscientious application of democratic processes to the transfer of power and the acceptance of the results, noncontentious participation in the political process, thoroughgoing study of public policy issues and scrutiny of the work of government officials, willingness to sacrifice for the future, patience with diversity and diverse views and the willingness to discuss issues calmly and with reference to well-researched arguments that make balanced treatment of a variety of alternatives, patience with the sometimes unavoidable slowness of needed change, willingness to accept responsibility for accomplishing needed changes without looking toward government or any faction for instant solutions, and a determination to acquire new skills as rapidly as possible and to learn whatever is needed to cope with expected future developments.

Science fiction today has a special mission to fulfill, and the rising interest in science fiction on the part of the general public is one of the most encouraging developments in the entire picture. Right now most people are still in the "escape" phase of their interest in science fiction, but they will hopefully make the transition to the "thoughtful" phase, and when they do, science fiction will emerge as *the* relevant cultural process of our time—the process by which people develop the kind of thinking needed to work together to solve the great problems of our time.

JON D. ROLAND
1015 Navarro
San Antonio, TX

We're dealing here with special kinds of long-range problems: problems whose solutions are not needed immediately, so it's hard for people to feel a sense of urgency, but problems which are so big that a long time will be needed to solve them. Science fiction people, as you suggest, have been concerned with such problems for a long time. Only recently have growing numbers of people outside this field begun to recognize that the reality they live in is full of such problems. It remains to be seen how many of them will become—and remain—thoughtful enough to face the fact that they have to start working on those problems now, *even if the answers won't be urgently needed until decades from now.*

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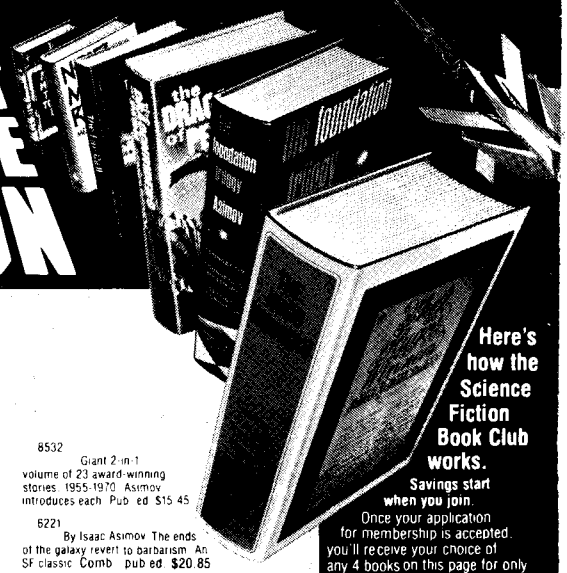

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